SCIENCE LIBRARY

NOV 17 1924

November 15, 1924

McGraw-Hill Company, Inc.

Twenty-five Cents Per Copy

ENGINEERING AND MINING JOURNAL-PRESS

A CONSOLIDATION OF ENGINEERING AND MINING JOURNAL AND MINING AND SCIENTIFIC PRESS

Driving the Moffat Tunnel

Good organization and equipment expedite work

By D. C. Deringer, Jr.

Novel Sulphur Enterprise in Nevada

By A. J. Crowley

A Roughneck Report on the Arizona Apache Mine

By Dick Wick Hall

Marketing Fuller's Earth

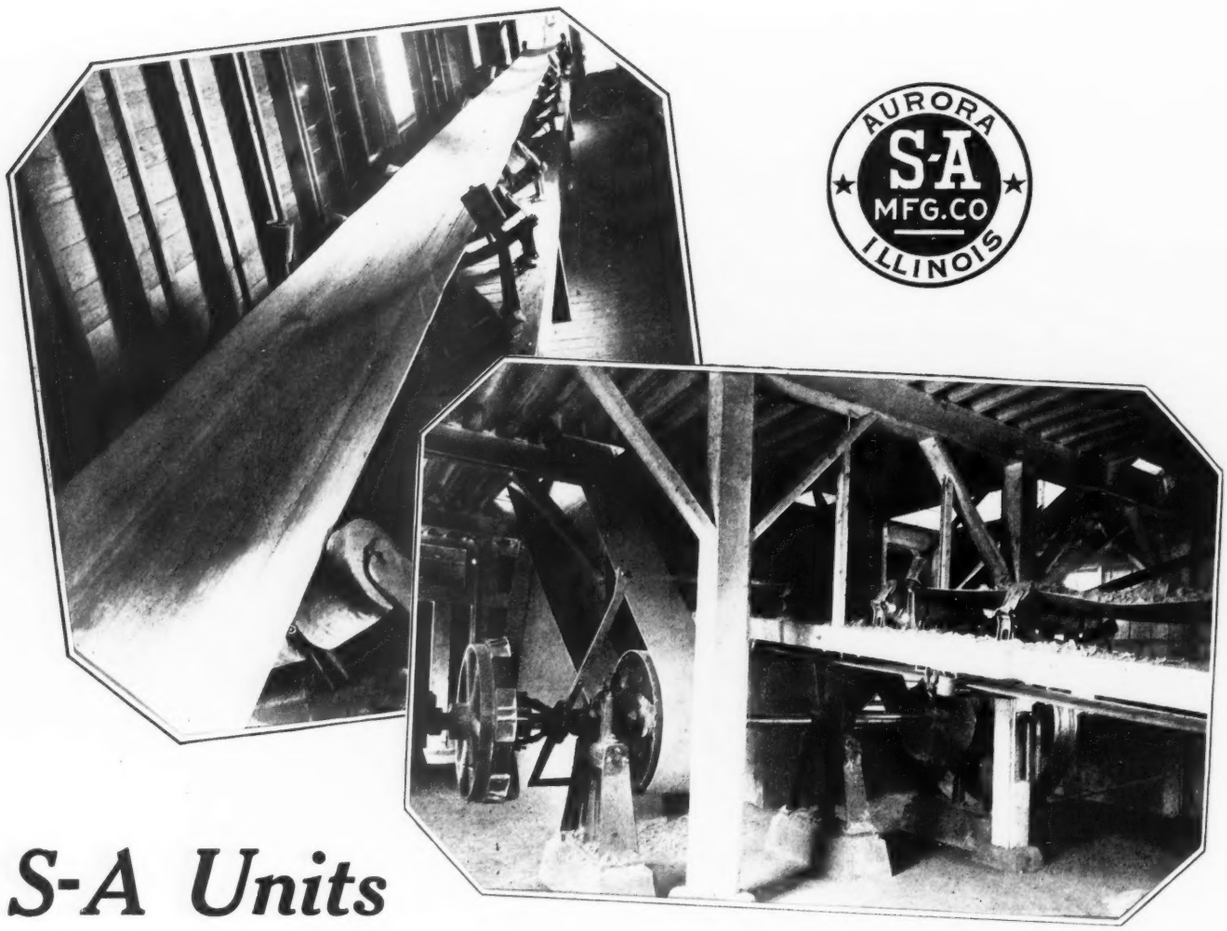
By Arthur B. Parsons

Practical Mine-Warehouse Accounting

By William T. May

Biography of PHILIP R. BRADLEY

at Sulphur, Nevada, are
ned both from the surface
d underground. When the
erburden is not too deep,
is plowed and scraped
with tractors and teams
d the ore excavated.



S-A Units —for heavy continuous duty

S-A Unit Carriers are *built* to stand the hard service conditions incident to conveying heavy ore. Because they are built of all steel they are practically unbreakable, their strong construction enabling them to handle large capacity in continuous heavy duty.

You can install S-A Unit Carriers in your plant and then practically forget them. As they are packed with grease before shipment, they will run a long period without further attention. The ball bearings on which the rolls are mounted and the accuracy with which entire Unit Carrier is constructed reduce power consumption 30%. Friction resistance is thus reduced to a minimum in the ease with which the belt slides over these easy turning rolls.

S-A Unit Carriers are also built with fittings for high pressure lubrication. These carriers are all-steel ball-bearing carriers exactly like the S-A standard carrier except the high pressure lubrication feature.

STEPHENS-ADAMSON MFG. CO.
AURORA, ILLINOIS

STEPHENS-ADAMSON

ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

Volume 118 | New York, November 15, 1924 | *Number* 20

Europe's Decreasing Importance in Metals

THE CONSTANTLY DECREASING importance of Europe as a producer, smelter, and consumer of non-ferrous metals in the last ten years, compared with the rest of the world, is well brought out in the latest report of the Metallgesellschaft. The *Metal Bulletin*, of London, has brought the matter to our attention. In the following tabulation, the figures in parentheses show the percentage of mine output for the various metals in the years 1909 to 1913, the adjacent figures being those for 1923:

	Lead	Copper	Zinc	Tin	Aluminum
Europe	(31) 18	(15) 7	(45) 21	(4) 1	(56) 38
Rest of the world	(69) 82	(85) 93	(55) 79	(96) 99	(44) 62

Europe still produces almost one-fifth of the world's lead, thanks to the Spanish mines, but that Continent formerly produced nearly one-third. Copper and zinc are each mined to only about one-half the extent that they used to be in Europe, compared with other continents. Aluminum has also lost, but is still important, France, Germany, and Switzerland being the principal producers, each mining about the same amount.

Smelter and refinery production data are as follows:

	Lead	Copper	Zinc	Tin	Aluminum
Europe	(46) 24	(19) 8	(69) 43	(25) 28	(56) 38
Rest of the world	(54) 76	(81) 92	(31) 57	(75) 72	(44) 62

In tin alone has Europe gained in her share of the work of ore reduction, partly owing to the fact that tin smelters in the United States have been unable to compete with the costs of fuel and labor in England and have all closed down. Europe, it will be noted, still smelts a little more lead and copper than she mines, and considerably more zinc, owing in large part to the Australian concentrates that are imported. The smelter production of aluminum in Europe corresponds with the mine production.

The data on consumption are no less interesting:

	Lead	Copper	Zinc	Tin	Aluminum	Total
Europe	(61) 42	(60) 36	(70) 50	(52) 35	(51) 33	(63) 42
Rest of the world	(39) 58	(40) 64	(30) 50	(48) 65	(49) 67	(37) 58

Zinc seems to be the metal that is relatively most in demand in Europe, but her consumption of that metal has fallen to half the world's production. Aluminum is the only one of the five metals considered of which Europe produces more than she needs, but her export surplus is not great.

The United States is, of course, the principal factor in the "rest of the world," especially when consumption is considered. In production, the United States ranks nowhere in tin and is not quite so important in copper since the South American and African deposits have been developed, though Uncle Sam is still the miner of a little over half the world's copper, 55½ per cent in 1923, to be exact.

What is to be deduced from these figures? Are Europe's ore deposits giving out? Will she continue to lose during the next ten years in production or consumption or both? In the brief summary of the Metallgesellschaft's data given above we have neglected to show the figures for 1914-1918 and for 1919-1923, but Europe's retrogression is a progressive one; the tendency was against her as well if we compare the period 1919-1923 with the year 1923, as for the ten-year interval.

We are inclined to believe that Europe will have a somewhat larger share of both production and consumption in the 1925-1935 period than she had in 1923, and that 1923 will mark the point of "furthest south" in her metal depression. In the last few years she has been obliged by financial considerations to do without most everything so far as possible, metals included. The decreased demand has naturally affected mine production. With prosperity gradually returning, as now seems assured after six years of post-war indecision, Europe should regain some of her lost ground both in production and consumption. This does not mean that the United States will suffer as a result. Even though our share in the world's totals may lessen somewhat, we may still, and should, show a healthy increase in both production and consumption of the metals.

The Voice of Democracy

IN THE *Engineering and Mining Journal-Press* of Oct. 11 we cited editorially President Coolidge's views of the functions of government in business. We quote from that issue:

> "The soundest plan is to frown upon the doing of work by the government which private skill and capital can do; as President Coolidge says, if the people can run the government, they can likewise conduct business—direct and not through the instrumentality of the government which they have set up for political, not business, purposes,"

There were a number of features in the election of Nov. 4 which demonstrated beyond doubt that the voters of the United States have a frame of mind quite diametrically opposed to that held by the little, near-sighted group which dominates Russia. The most significant, of course, was the sweep of public favor away from La Follette, an honest, earnest, and unpractical man, who advocated the government ownership of railroads. McAdoo, who ran the railroads for the government during the war emergency, never subsequently had any illusions about the advantages of government control. The voters were keener than La Follette.

What is not so well known is that there was voted on in California a bill to authorize the state to buy and build hydro-electric generating and transmission systems; and this although the state is gridded with enterprising and growing hydro-electric installations, whose charges to the public are controlled by the State Commission. This impracticable proposal to saddle the taxpayers of California with an additional useless burden was defeated by them three to one. The voter remembered that he was also the taxpayer. Also, in the State of Washington there was up for ratification a bill permitting cities and towns to buy and sell electric current both within and outside of their city limits and to acquire and construct electric generating and distributing systems. This was similar in intent to the

California plan. Likewise, it was defeated by more than two to one in every county of the state.

That the election went our way is doubtless why we feel satisfied with it. Nevertheless, the bulk of the voters felt the same way. The people—men and women—turned out and voted as a solemn duty. The President of the United States made his final radio speech to the nation, simply urging them to vote and pointing out the dire consequences which would result to the country if the suffrage were despised and neglected. He made no plea for himself nor for his party. Doubtless this lofty attitude won him far more votes than the most passionate last-minute appeal for election would have done, for the people have demonstrated that they are shrewd judges in the long run.

A notable event in one of our cities was the building by a private citizen and the presentation to the city of a specially and tastefully designed voting building—small but apart, and dignified. This symbolizes the importance and the majesty of the act of casting the ballot. We hope that this fashion will be followed—that temples of voting will eventually be set up in all voting centers—impressive in design and inspiring with noble mottoes, so that the citizenry may continually be reminded and impressed with the fact that these are the centers of democracy—the centers of their hope of equitable government.

World Copper War a Reporter's Dream

A FEW DAYS AGO the *New York Herald-Tribune* featured a story about a coming war between the Anaconda and Guggenheim interests in the European copper market. The Guggenheims, it was said, were to establish selling offices in England and thus to start a bitter competitive struggle to dump surplus American copper abroad for what it would bring. The whole story is absurd, as any one conversant with the marketing of copper in Europe knows. All of the more important American copper producers maintain their own selling agencies, or are in close touch with independent agencies, in the more important European capitals. Since withdrawing from the Copper Export Association Guggenheim Bros. have not had a regular outlet in England, though they have been represented by Jacques Guggenheim in Paris and by the Koning Kupfer und Blei Gesellschaft in Berlin. They are now to establish a selling agency in England, at Manchester.

No war of any kind is threatened. In fact, there is probably better feeling between the foreign agencies selling American copper than has existed for some time.

This copper war story is another evidence of how far newspaper reporters sometimes dress up their stories to make sensational reading. The *Herald-Tribune* also gave considerable publicity of the wrong kind to the Tomadelli cold light scheme a few months ago, and more recently a reporter was publicly dismissed for an imaginary yarn about a floating palace of liquid refreshment just outside of New York harbor.

Exportable Surplus of Copper Increases

IN OUR ISSUE OF MAY 17, we pointed out the futility of an import duty on copper so long as the United States exports considerably more than it imports. We have found no one who takes exception to this argument, but it is felt by many that our imports of copper have increased so fast that they will soon overtake our exports and that it would be well to have a customs duty already provided which would then become effective. It was shown in our May editorial that for six months ended March 31, 1924, our exportable surplus of copper averaged 21,000,000 lb. per month. The data of the U. S. Department of Commerce for September are now available, and for the six months ended Sept. 30, our exportable surplus averaged 35,000,000 lb. per month, or almost twice as much. The statistics by quarters, assuming brass and bronze reported to be 80 per cent copper, as before, follow:

	Pounds		
1923	Imports	Exports	Exportable Surplus
First quarter	141,685,000	198,850,000	57,165,000
Second quarter	197,999,000	194,500,000	—3,499,000
Third quarter	194,831,000	210,100,000	15,269,000
Fourth quarter	177,556,000	238,500,000	60,944,000
1924			
First quarter	206,160,000	271,300,000	65,140,000
Second quarter	198,728,000	308,610,000	109,882,000
Third quarter	176,887,000	277,860,000	101,173,000

Imports into the United States have shown a substantial decrease since the first of the year. It is also evident that there is no immediate threat of our exportable surplus sinking to a minus quantity, as it did in the second quarter of 1923. Rather is the tendency the other way, and with European conditions becoming more stabilized, our exports are likely to show a material increase. A copper tariff seems more futile now than it did six months ago, particularly as the price seems to be going up without it.

Deep and Narrow

WE HAVE BEFORE COMMENTED editorially on the fact that as modern specialists dig deep they are also obliged to narrow their field; in proportion as they know more about their subject, they know less of other subjects. This is imposed by the ever-present limitations on the brain capacity of every man.

Did we need an example of this, we could find it in an "open letter"—an editorial under the signature of Prof. Richard T. Ely, director of the Institute for Research in Land Economics and Public Utilities and professor of economics in the University of Wisconsin. Professor Ely has a well-earned national reputation and is a leader in his field. From his editorial we quote:

"Research in economics is of a very peculiar nature. A bit of metal is submitted to a chemist. His analysis indicates that it is mere mica—fool's gold. His client is satisfied. The case is not so easy in economics."

We do not mean to imply anything but respect to Professor Ely when we point out to him the numerous elementary mistakes in this paragraph:

1. Mica is not metal—not even a metallic mineral.
2. Mica is not fool's gold.
3. Fool's gold is a common name for pyrite, which is not a metal.
4. Neither mica nor pyrite is submitted to a chemist for identification by anyone with an elementary knowledge of such things. They are submitted to the prospector, the miner, the mineralogist or the geologist.
5. No analysis is necessary to distinguish between mica, pyrite, and gold. Ordinarily a glance is sufficient—if not, a few glances more to determine the distinct physical properties.
6. And, finally, if we were to be captious, we should take exception, also, to the conclusion that, "his client is satisfied."

Did anyone ever know of an instance where a farmer (only a farmer or an economist would be likely to play such a rôle) who brings to a miner or geologist a shiny, yellowish mineral, and is told that it is not gold, goes away satisfied? It isn't human nature. This sentence should read, "The client is sore." Moreover, if a client is one who pays a fee, this word is inaccurate, for the collection of a fee in a case like this would not be a natural phenomenon—it would be a miracle. Therefore the sentence should read, "The farmer is sore," or, "The economist is sore."

If we have used the example given by Professor Ely to illustrate a point which we have before made, it is not, we repeat, anything to the disadvantage of that distinguished specialist. If you get us outside our own field, we shall give quite as instructive an example. We happen to know fool's gold, but we illustrate other kinds of narrowness which we will leave Professor Ely to discover. And so do you, dear reader.

Hunting the Golden Goose

THE OPEN SEASON for the farmer in the Western states to go after the miner with taxation rifles has been extended, and the sport is now a year-round one. Various protests come to us in the way of pamphlets and propaganda from the mining companies. It is dangerous for the farmers to pursue the care-free course they do, for the golden eggs will not be forthcoming after the goose has passed away. Imagine the intelligence of the agrarians who are imposing a heavy tax on the gross production of the copper mines of Michigan, which are just about able to live under the overwhelming competition of copper mines in other states! These greedy taxers will succeed in chasing the miner out of one state into another, with no assurance that he will find rest anywhere. They are hounding a basic industry, essential to their own prosperity.

In quite unorthodox manner, Florida has seceded from the heavy-taxers in one particular at least—the state income tax. She has adopted an amendment to her constitution providing that there never shall be any state tax on private incomes. Florida comes out and bids for capital to come and make its home with her, instead of treating it as an outlaw! There will doubtless be a flow of capitalists to this shameless state; and, in the same way, a flow of mining capital to those states who do not badger and bleed the mines, from those states that do.

In Idaho, the secretary of the Idaho Mining Association, Ravenel Macbeth, has compiled some figures to show that mining in Idaho is a legitimate industry and should be protected, not penalized. He shows that in 1923 the expenditures for non-profit-earning mines in Idaho (including 486 companies and the assessment work on 11,914 mining claims) was $8,049,594; the net mining profits in Idaho were $5,183,869. This is rightly considered as an argument against taxation of the gross output. It shows that more money went into Idaho in 1923 than came out, so far as the stockholders are concerned. But the lawmakers must not forget that thousands of mine workers receive their living wage, and even something over, out of this industry. Labor has received its first-preferred and guaranteed dividend, whether capital has won or lost.

That more capital goes into mining than comes out has been true in many years and in many camps. There are few industries where capital contributes more recklessly to labor and the equipment industries than in mining; and the farmers get their share of this safe and easy money. Whether capital is justified in this course is another matter; but if the agrarians in any state can combine to coax mining capital to continue to spend and to venture, they are that much in. If they add to the hazards of mining the sure detriment of taxation of gross output, they are that much and more out, and in a very short time.

Franco-German Commercial Alliance

WHAT WAS INEVITABLY INDICATED in the cards appears to be actually transpiring in the Franco-German situation. The long years of struggling over the great coal and iron fields which lie between the two countries have resulted in a deadlock. Before the Great War Germany possessed them, and the resultant wealth of steel and coal came near making her the master of the world. In the struggle, France sought and kept one of the great bones of contention, the Lorraine iron fields. But still the coal fields of the Ruhr, essential to the control of the steel industry, remained in Germany.

When France occupied the Ruhr it was with the hope that the occupation might be permanent and that France might occupy the same rôle in the commercial and hence political world in the future as Germany had done before the war. This vision was not pleasing to Great Britain—nor indeed to the more absent-minded United States, any more than it was to Germany; so it soon became clear to France that she would be unable to keep the coal mines of the Ruhr. Whereupon the inevitable result took place, according to recent dispatches from Paris—a commercial agreement—in effect a commercial treaty—between the great French and German iron and steel industrialists, which is in effect a partnership between France and Germany. According to a dispatch to the *New York World:*

> "The basis of the agreement is a special price on Ruhr coke sent into Lorraine, the Saar, and Luxembourg, where half-finished steel products will be made under a combination of cheap ore, cheap labor, and cheap fuel. The half-finished articles will be returned to Germany for completion and marketing. Thus the co-operation between Lorraine steel and Ruhr coal will be as close as it was before the war when Germany owned both. Humbert de Wendel, acting for the Comité des Forges, an organization of the big French ironmasters, and August Thyssen and Albert Voegler, representing the Ruhr industrialists, themselves two of the largest, concluded the agreement."

This natural combination will not be allowed to go unchallenged. Great Britain will oppose as strongly as possible. American interests will be deeply affected and will be opposed. "Under the agreement reached," says the dispatch, "Franco-German steel rails will dominate the world market. American and British manufacturers will not be able to touch the combine's prices."

It remains to be seen how much the pressure of creditor nations, like Great Britain and the United States, on debtor nations, like France and Germany, can prevail to prevent this natural economic alliance. It is likely, though not certain, that economic forces may prevail against political pressure. And there are compensations for every deprivation. A France and Germany united by the solid intertwining ties of the $ will be a greater guarantee to the future peace of the world than any other one element.

Mining Engineers of Note

Philip R. Bradley

PHILIP R. BRADLEY was born at Georgetown, El Dorado County, Calif. His father, a graduate of the Massachusetts Institute of Technology, was a pioneer of California and did much of the early engineering work for the mines in El Dorado, Placer, Sierra, and neighboring counties. His brother, F. W. Bradley, following in the direction taken by the father, had become well established in the mining industry by the time the younger Bradley was ready to take up his life work. Surrounded by a mining environment and with the example of his father's and brother's success, it was inevitable that he should take up mining. He entered the College of Mines, University of California, at a time when mining did not greatly interest university students. There were only three mining students in the class of 1896, and two of these dropped out, leaving Philip as the sole survivor. However, the rapid mining development of South Africa and Western Australia and the dearth of competent mining engineers soon attracted attention, and many young men flocked to the university. Thus Philip was graduated at a time when mining interest was in the ascendant. His first work was to continue the management of the Spanish mine, which was one of the classic examples of low-grade ore mining and which was brought to profitable operation by F. W. Bradley. The ore yielded from 50 to 60c. per ton. The mine was worked from 1885 to 1900. Only the most careful management and engineering made the enterprise successful. Necessity is the greatest master, after all, and the younger Bradley was fortunate in having to concentrate at an early time upon the problem of making a low-grade mine pay. The lessons learned here were invaluable in after life. Captain De Lamar and others engaged his services after he left the Spanish mine. The high tide of mining interest at the time resulted in scouting for mines in many countries, and any property that looked as if it might have merit was examined. Contact with new districts and able mining engineers during this period added much to the general knowledge of mining that Philip Bradley acquired. In 1901, he made a thorough investigation of the Sudbury nickel district for De Lamar. While the examination was in progress De Lamar became one of a syndicate of four, including E. C. Converse, C. M. Schwab, and R. M. Thompson, which subsequently organized the International Nickel Co. On completion of the examination work Bradley was sent by the syndicate to New Caledonia, where he remained the greater part of a year, engaged in examining the nickel mines. Upon returning to New York, he was sent to Sudbury to superintend the smelting operations of the company. Later he went to British Guinea as manager of the Peters mine, which turned out to be a disappointment. Following this experience in the tropics, he engaged in consulting work. In 1914, he became general superintendent of the Alaska Treadwell and allied companies. Later, when the Alaska Treadwell was shut down, he became consulting engineer and manager of the Alaska Juneau. This low-grade gold mine has engaged his attention, and by systematic work and the cutting of many corners the property has been partly set upon its feet.

PHILIP R. BRADLEY

The failure of the mill after it had been turned over by the contractors and designers proved to be an almost insurmountable obstacle. However, selective milling, involving the speedy rejection of more than half of the ore after it had been rough crushed, opened up a hopeful possibility of retrieving the situation. The mill was rehabilitated and adapted to the new system. Mining operations were reorganized, and a new mining system was conceived. The operation of the Alaska Juneau mine is of great interest to the mining industry, as it indicates what intensive study and pertinacity can accomplish in the face of almost insurmountable obstacles. Both of the Bradley brothers, Philip and F. W., are directing the work upon the property, and whatever success is achieved will be due to their mining experience and operating skill. Philip is also consulting engineer for the Treadwell-Yukon Co.

Driving the Moffat Tunnel

Good Organization and Equipment Expedite Work

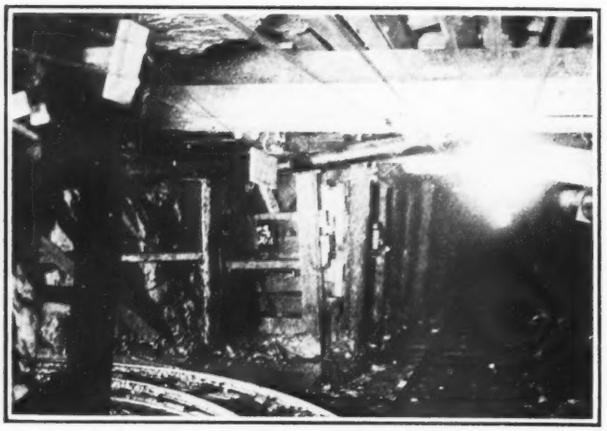
By D. C. Deringer, Jr.
Mining Engineer, Golden, Colo.

A DIRECT RAILROAD from Denver, Colo., to Salt Lake City, Utah, was recognized by the early pioneers of Colorado as necessary to develop that vast territory on the western slope of the Continental Divide that is so rich in coal and agricultural land. This project remained a dream, on account of the high passes over the divide, until the late David H. Moffat conceived the idea of driving a tunnel through the divide at the most accessible point, which engineers had found to be near the base of James Peak. The Santa Fe crosses the Rockies at Raton Pass, in New Mexico, which is at an elevation of 7,608 ft., and the Union Pacific crosses the divide at Sherman Summit, with an elevation of 8,013 ft. The Denver & Rio Grande crosses Colorado, in its travel from Denver to Salt Lake City, at Tennessee Pass, which is at an elevation of 10,240 ft., but to accomplish this it must zigzag its way over 281 miles to reach a point 74 miles from Denver in an air line. At the same time it missed undeveloped Moffat County and the Green River valley. The Denver & Salt Lake R.R. now terminates at Craig, 255 miles from Denver, and crosses the divide at Corona, at an elevation of 11,660 ft. The completion of the Moffat tunnel will shorten this distance by 23 miles and eliminate 27.6 miles of 4 per cent grade, the highest elevation being the apex of the tunnel, which is 9,249 ft.

The Moffat Tunnel Commission called for bids for driving the tunnel on a unit basis. These were opened Sept. 12, 1923, and though ten bids were received, only one met the specifications, and all were excessively high. Further investigation showed that the reason for excessive bids was because the contractors had to add large sums to cover unforeseen contingencies, and bonding companies asked large premiums for bonding the contractors. Both added to the amount of the bids. The commission rejected all bids and again called for bids on a fixed fee, with certain "profit-sharing" features. A penalty of $1,000 per day for each day required in excess of forty-six months and a bonus of $1,000 per day for each day under forty-six months was specified. On this basis three bids were received. Hitchcock & Tinkler, being the lowest bidders, were awarded the contract. Hitchcock & Tinkler have been associated for the last twenty-five years in tunnel driving and have a long and successful record behind them.

The east portal of the Moffat tunnel, showing the camp and the dump in the foreground

Camp construction at the east portal was started in September, 1923, when the following buildings were constructed and equipped: A compressor plant with three Chicago Pneumatic compressors having a rated capacity of 1,140 cu.ft., and one Ingersoll-Rand compressor having a rated capacity of 420 cu.ft. of free air per minute at sea level, to furnish air for drilling and operation of an air shovel working in the enlargement; a blacksmith shop equipped with two Sullivan drill sharpeners, two oil furnaces for heating the steel, and one oil furnace for tempering it; a carpenter shop equipped with one 20-in. circular saw for framing the timber; one-story bunk houses sufficient to accommodate 240 men; a two-story recreation building, one floor



Crosscut connecting pioneer tunnel with the main heading

of which is provided with billiard and card tables, lounging room and camp commissary, the second floor being arranged as a moving-picture theater which can be quickly changed into a dance hall; a change-house containing sufficient lockers and shower baths for all employees; a combination cook house and mess hall large enough to accommodate 240 men; a contractors' office, and a time office. The commission has a combination office and sleeping quarters occupying a one-story building for employees of the commission. In addition, there are a few private houses for employees with families.

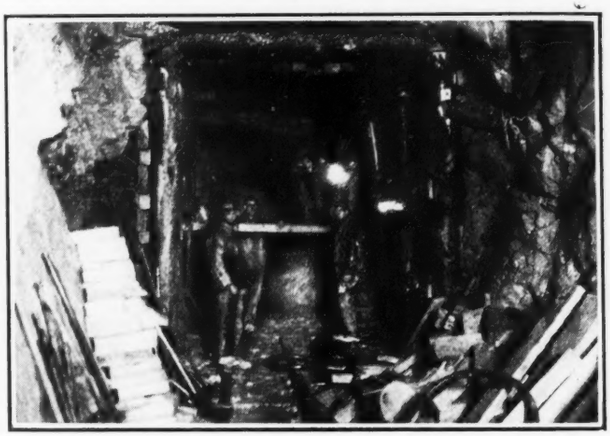
All buildings are furnished with a pipeless furnace, electric lights, running water, and toilet discharging into a septic tank. There is also a small hospital with a surgeon in charge. All buildings are of lumber and covered with rubberoid roofing. The camp at the west portal is practically the same as that at the east portal with the exception that the compressor room is equipped with Ingersoll-Rand compressors.

The relative position of the water or pioneer tunnel and the railroad tunnel is shown in the accompanying sketch. The pioneer or twin heading system of tunnel driving has been adopted, because it is believed that it will not only facilitate the speed of driving, which is a big economic factor, but the pioneer tunnel can be used for bringing water from the Fraser River to Denver when completed. The last considerations make the pioneer system particularly advantageous.

The railroad tunnel is the United States standard size, 16 ft. wide and 24 ft. high to the top of the semicircular roof. The water tunnel and the heading of the main tunnel each are 8x8 ft., according to specifications, but actually the contractors have chosen to make them both about 9 ft. wide to facilitate handling the equipment.

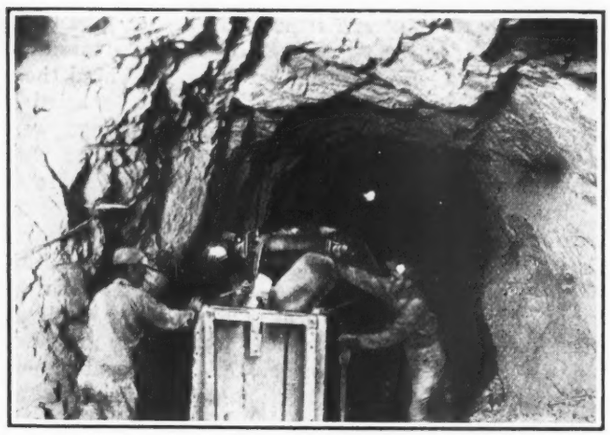
Both headings are advanced simultaneously. All transportation for both headings is through the water tunnel. Crosscuts are driven approximately every 1,500 ft. to the main railroad heading, and as the enlargement is completed the crosscuts are bulkheaded. The water tunnel carries an 8-in. air line, 12-in. blower line, and a 3-in. water line. A 3-in. air line, 12-in. blower line, and a 2-in. water line branch off from the water-tunnel mains through the nearest crosscut and supply the railroad or main heading. All pipe that is used is well casing fitted with special joints made by the Dayton Pipe Co.

In the headings, holes are drilled 9 ft. deep, using 1¼-in. steel, with four Ingersoll-Rand Leyner drills mounted on a drill carriage. The drill carriage consists of a pair of trucks running on a track of 24-in. gage on which are attached two horizontal channel bars paralleling the track. Two vertical steel posts, or columns, are attached to a carriage which can be moved either backward or forward by means of a windlass. This is attached to the rear end of the channel bars and uses the channel bars as a track. The two vertical columns are rigidly held together by a horizontal crossbar, which extends out on each side of the track. On one end of the crossbar is a screw-jack which is made tight against the side walls while the machine is in operation.

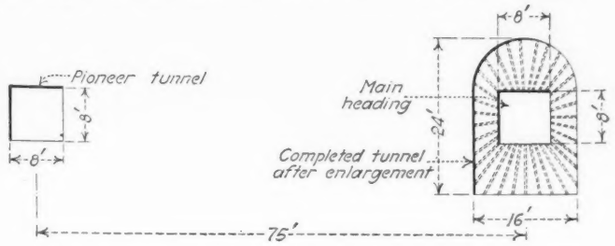


Timber gang at work in the heading at the west portal

An air manifold is mounted on the rear of the channel bars, leading from which are four air-hose connections supplying the drills. The air is bypassed through oil kept in the bottom of a chamber, thus oiling the



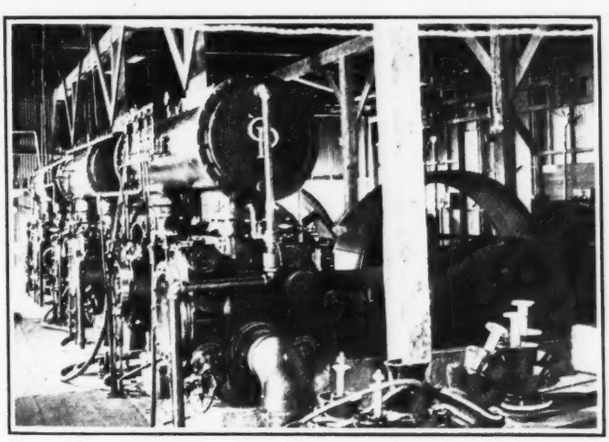
Conweigh electric loader working in the pioneer tunnel



Sketch showing relative position of the pioneer and main tunnels

drills. There is also a main water manifold on the carriage, from which four hoses connect with the four drills. The drills are mounted on the arms of the carriage, connected with the water and air supply on the carriage, and are not removed except for repair. Thus, the only thing that is necessary to set the drills in operation is to run the entire carriage to the heading, make one air and one water connection, screw the jacks against the side walls of the tunnel, and start operation. The record for setting up the four drills is eight minutes, and the average time is from twelve to fifteen minutes. A round of holes is drilled in one heading and shot in from three and one-half to four hours. The drill carriage with the drills mounted is taken to the other heading through the nearest crosscut. Before the round is shot, the valve in the air main near the heading is opened. Within twenty minutes after shooting, the mechanical mucker is working on the muck pile.

A Conweigh mechanical mucker, operated by a 50-hp. electric motor, is kept in each heading, because the machine is too large to transport conveniently from one heading to the other. The entire machine moves horizontally along the track, pushing a dipper into the muck pile. When loaded, the dipper, together with a table on which the mucker is mounted, is raised at the front end, allowing the muck to slide down the table onto a belt conveyor, which drops the muck into a car at the rear of the machine. Using this machine the muck from one round of holes is put on the dump in four hours from the time the round is shot. The mucking gang is in one heading while the drillers are in the other. Thus a round of holes is drilled, shot, and mucked out in each heading per shift.

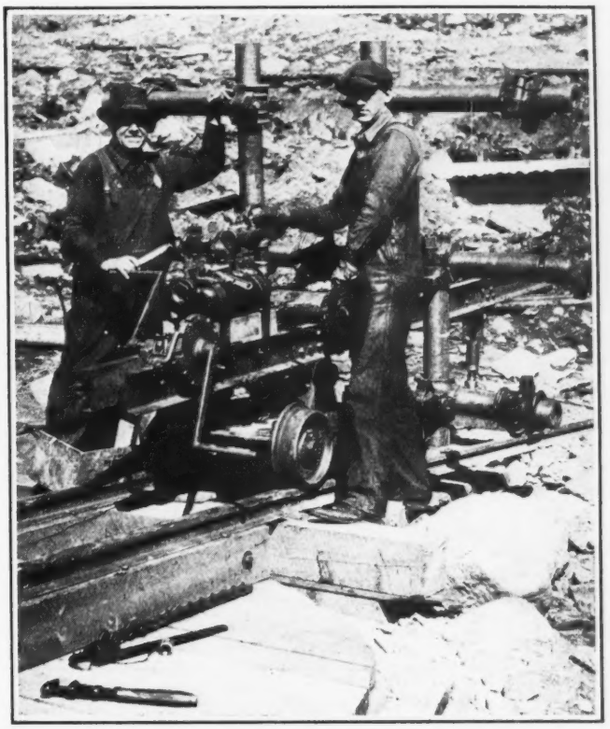


Compressor plant at the east portal

Air is the power for loading in the enlargement as well as for drilling

The mechanical mucker discharges into 50-ft. capacity side-dump cars. These cars are hauled to the nearest crosscut by a five-ton battery locomotive, where they are picked up by a five-ton 250-v. d.c. trolley locomotive and taken to the unloading platform just outside the portal of the tunnel. The cars are then dumped into 4-yd. capacity side-dump steel cars, which are later taken to the dump. The mechanical mucker fills a car in one and one-half minutes. On actual operation about fourteen 50-ft. cars are loaded an hour.

The enlargement is kept approximately 1,500 ft. behind the main heading so as not to interfere with the work at the face. When the rock is sufficiently hard to stand, "ring" shooting is employed. By this method

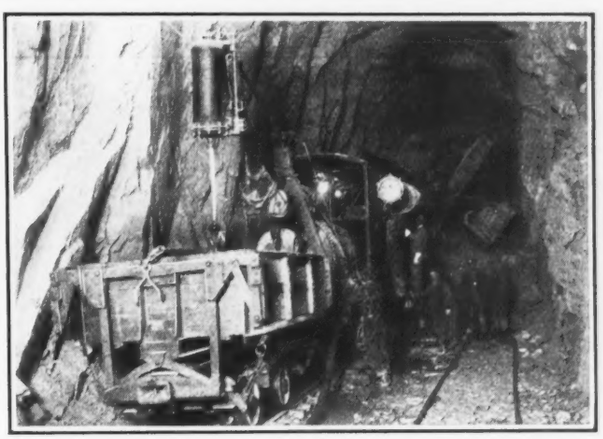


Carriage for mounting six drills

By means of this device the time required to "set up" in the heading is reduced to a few minutes.

a ring of holes, as shown in the sketch, is drilled from the 8x8-ft. tunnel to the outline of the main tunnel. The distance between holes is 3 ft., and the rings are 4 ft. apart. The drilling for the enlargement is kept well in advance of blasting. Usually four of the "ring" rounds are shot in rapid succession by electric delayed fuses, so that each breaks against an open face.

Denver Rock Drill stopers are used for the roof and walls, and Ingersoll-Rand drifters for the bottom. The muck is loaded into 4-yd. side-dump steel cars, running on a 36-in. track, by a No. 43 Osgood air shovel with a 1-yd. dipper. At the rear of the air shovel is an air crane that transfers the 4-yd. cars from the side track, containing the empties, to the loading track. An eight-ton 250-v. d.c. locomotive handles the empties and another hauls the loaded cars to the portal, where they



Air-operated shovel loading cars

Note the air crane used to lift cars from the "empty" to the "loading" track

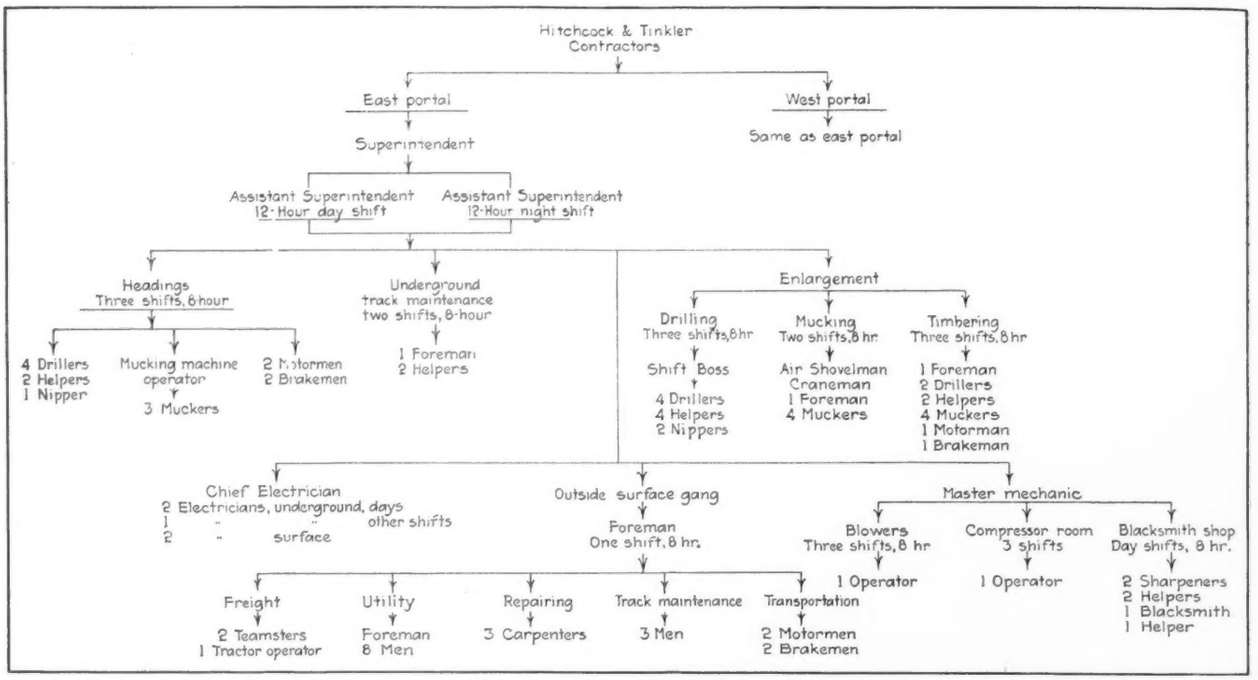


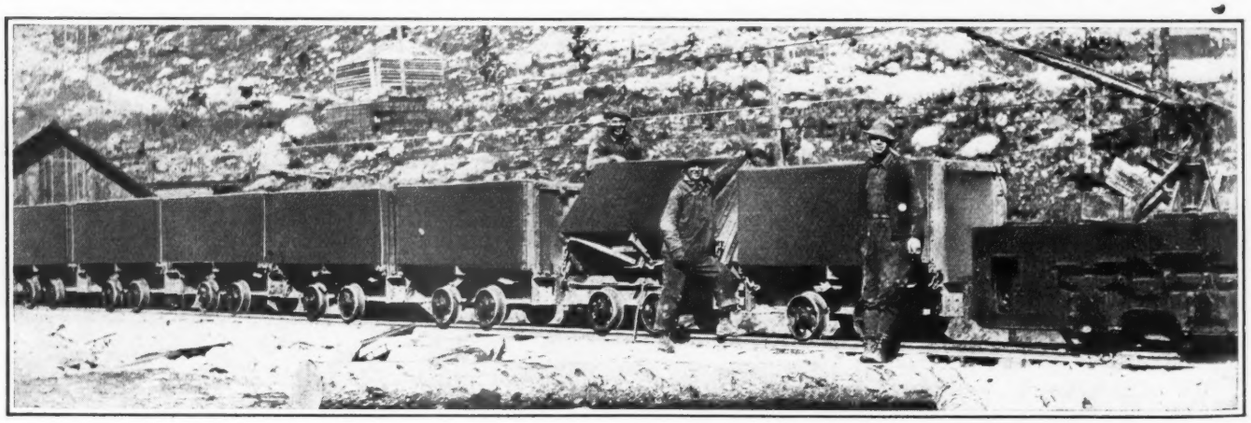
Chart showing the organization of the contractors' force engaged on the Moffat tunnel project

are picked up by a similar locomotive, together with the cars loaded from the unloading platform, and hauled to the dump.

The rock encountered is a complex of gneiss, granite, and schist. In the east portal only occasional soft seams are encountered. These stand long enough as a rule to allow the heading to be cleared after shooting and timbered with square sets, 8x8 ft. As soon as the heading has advanced beyond the next crosscut, the timber gang enlarges the heading and puts in jumbo sets. The ground above the jumbo sets is then excavated, and a standard five-segment arch timbering of Oregon fir is put in. This allows the air shovel to advance through the soft seams without delay, removing only the bottom of the tunnel.

The ground in the east portal stands well and only occasionally has timbering been needed. The ground in the west portal, however, is disintegrated, and practically the entire tunnel requires timbering. This is the reason why the progress in the west portal is only about 50 per cent as rapid as in the east portal.

All work underground is carried on in three eight-hour shifts with the exception of the air-shovel operator, crane operator, and the gang working with the air shovel. In this particular work two eight-hour shifts are employed, beginning at 7 a.m. and 7 p.m. The interval between shifts is allowed for shooting. It has been found that two shifts are sufficient to keep up with the three shifts working in the headings. Men working in the east portal headings are paid a day rate plus a bonus for additional footage when the progress for fifteen days averages more than 255 ft. per heading. For the first 90 ft. over the 510 ft., drillers receive 15c. per foot, muckers 10c. per foot, and motormen and brakemen 5c. per foot. From 600 to 675 ft., 20c., 15c., and 10c. per foot respectively; and for all over 675 ft., 30c., 20c., and 15c. per foot respectively, are the bonuses. To date the men working in the enlargement do not receive a bonus, but a system will probably be worked out soon. The men working in the west portal do not receive a bonus, because a satisfactory basis for paying a bonus cannot be arranged, on account of

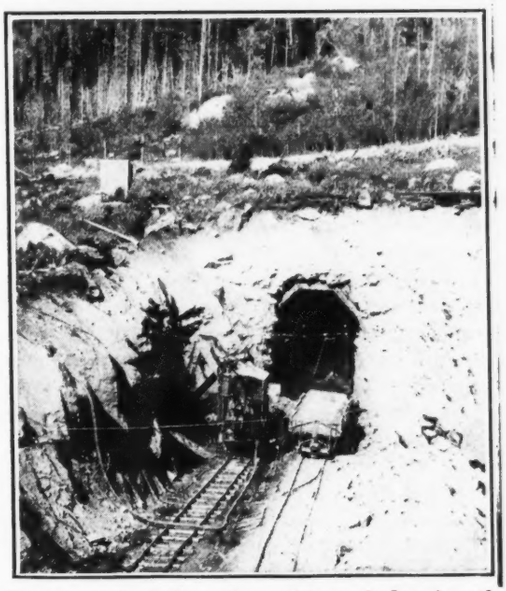


Motor-hauled trains of 50-cu.ft. cars from underground are dumped into trains of 4-cu.yd. cars for transportation from the portal to the dump

the changeable nature of the ground. The contractor's organization chart is reproduced to show the details of his force. The progress for each month to date is as follows:

	East Heading			West Heading		
1923	Water Tunnel	Main Tunnel	Enlargement	Water Tunnel	Main Tunnel	Enlargement
Sept.	....	....	....	32	....	....
Oct.	75	....	....	295	....	....
Nov.	367	....	....	610	....	....
Dec.	638	26	....	972	....	....
1924						
Jan.	1,014	303	....	1,354	47	....
Feb.	1,395	740	....	1,729	215	....
Mar.	1,937	1,285	30	2,187	510	....
Apr.	2,294	2,027	333	2,554	775	22
May	2,999	2,737	533	2,476	1,047	166
June	3,676	3,404	787	3,383	1,603	376
July	4,135	3,960	1,087	3,930	2,466	481
Aug.	4,838	4,661	1,152	4,272	3,174	481
Total	23,369	19,143	3,922	23,794	9,837	1,526

The maximum average daily progress is 33 ft. per



East portal of the enlarged tunnel showing the Osgood shovel operated by compressed air

heading. This remarkable record is due to three factors; first, because the most up-to-date equipment offered on the market has been installed; second, because of the efficient organization of the operating forces; and, third, owing to the spirit which has been injected into the workmen by the officials. This spirit manifests itself in the character of men that stay on the job. When a visitor enters camp the first striking feature is the clean-cut appearance of the workmen and the friendly spirit existing between the employees and the officials. In the mess hall all eat the same "grub," and without any particular segregation of the classes of workmen. This spirit prevails throughout the entire camp.

The work is supervised by the Moffat Tunnel Commission, which pays all bills and passes upon all phases of the construction through its engineering staff, of which R. H. Keays is chief engineer, Burgis G. Coy, resident engineer at the east portal, V. A. Kauffman, resident engineer at the west portal, and C. A. Betts, office engineer. The commission also employs a general inspector at each portal, who reports directly to the headquarters in Denver.

Practical Mine-Warehouse Accounting

By William T. May
Superintendent, Iron Mountain Co., Iron Mountain, Mo.

MINE ACCOUNTING may be as intricate or as simple as desired. Usually, every mine executive likes to have his costs for the "day before" on his table each morning, so that he can keep his hand on the wheel and in touch with every detail. To do this the warehouse must function regularly and smoothly, with just enough routine to insure accuracy and enough simplicity to allow quick returns, for the items of materials and supplies have a direct bearing on the daily mine costs.

Some mining companies can afford a large staff of clerks, with the purchasing department and warehouse department separate; other companies that are not so fortunate must make one man in the warehouse keep the complete set of records, which must not be too cumbersome to produce accurate and speedy results.

For simplicity, we shall assume that the organization includes a purchasing agent, an accountant, and a warehouse man.

Requisitions for Purchase

When a supply is required, a requisition is made out by the authorized person or department and forwarded to the agent in the purchasing department. He in turn, if the demand is not urgent, sends out quotations to four or five different firms requesting prices, delivery, and terms. The copy of the quotation is attached to the requisition and filed in a "Quotation Pending" file under the name of the commodity. When the replies to the requests for quotations are received, they are filed with the copy mentioned above, and when complete are removed and attached to the duplicate order. The order usually consists of four variously colored copies. The third and fourth copies have a space for the receipt and signature of the warehouse man, and consequently are used as receiving reports. The original order is forwarded to the firm getting the order. To the duplicate order are attached the requisition and the quotation, and it is filed in the orders pending file under the firm name. To this file are added the acknowledgment of the order, any correspondence with reference to the order, the shipping notice, the bill of lading, a duplicate copy of invoice, and the duplicate freight bill.

This file is now complete and the information is transferred to a card index under the name of the commodity, and the cumbersome papers are filed under the "Filled Order" file, and they need only to be referred to in very rare instances, as the card index gives the purchasing department all the information usually required. The third and fourth copies of the order are sent to the warehouse man, who files them under "Orders Pending."

Checking Receipt of Goods

All invoices are requested in triplicate. The original copy goes to the accountant, the duplicate copy to the purchasing department, and the triplicate copy to the warehouse man, who attaches it to his orders pending.

When the goods are actually received, the warehouse man checks them carefully with his copy of the order and the triplicate invoice. If the order is complete, the warehouse man signs the quadruplicate order, at-

taches the original freight bill, and passes it to the accountant for payment.

If the order is not complete, the warehouse man makes a partial receiving report to cover the goods received, and, noting this on his copies of the order, he retains them until the remaining items are either received or canceled.

When the warehouse man's quadruplicate copy is complete, it will show all information required, and this is transferred to the warehouse man's card index. The cards represent the warehouse inventory and on them are the daily requisitions for supplies. Simultaneously with this operation the daily warehouse distribution is made up. I have found that an efficient warehouse man can do in two or three hours a day the routine work involved in handling $10,000 worth of supplies monthly.

The accountant has from his combination order and receiving report absolute information with which to check his invoice, and on which to base a claim in case the invoice is in error and has already been paid, as is often done when taking advantage of trade discounts.

Simple though the system may be, it leaves a complete record, and from the cards or voucher file one may find the details from the first requisition to the final distribution. In transactions for large mines, departments may replace individuals, and in those of small mines the warehouse man may combine the three positions and keep all the files in one office, using one set of cards only.

The different forms may be made up as desired, but they should contain certain basic information. The original requisition should give full specifications of the article required. It should also specify for what and by whom the supply is to be used and whether the demand is urgent or otherwise.

The quotation form should request prices f.o.b. a specified point, so that comparison of the prices may be easily made, as well as the weight of the supply, earliest date of shipment and terms of payment.

Instructions to Shippers Are Important

The order forms are made out in quadruplicate and usually on paper of four different colors. The original (white) sheet, stating the order number, firm name, and address of receiving point, quantity, description, and instructions, is mailed direct to the firm getting the order.

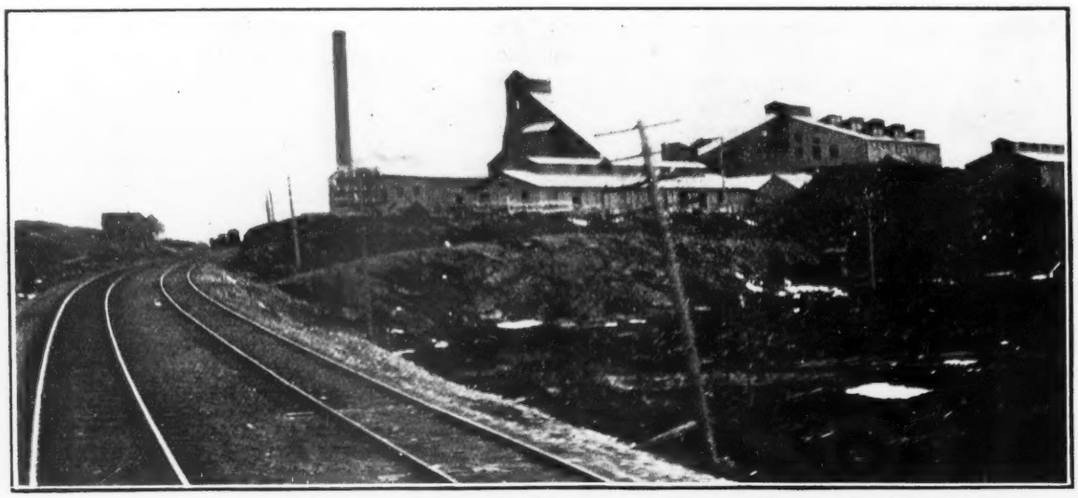
The shipping instructions may be printed on the back of the order and may be voluminous, laying down all kinds of rules and regulations, but these will probably not be looked at by the shipper, so it is preferable to have a few concise instructions on the bottom of the face of the order just over the signature. The following brief instructions have been found to suffice:

1. Acknowledge the receipt of this order, giving probable date of shipment.
2. Mark above order number on all communications and packages.
3. Invoices are to be rendered in triplicate to (firm name and address).
4. Mail packing list and bill of lading showing weights of packages.
5. We pay no drafts. No charges for packing and draying will be allowed.
6. Unless otherwise arranged, all goods received in one month will be paid for the 10th of the next month.
7. This order is automatically canceled if not filled within thirty days or special arrangements made.

The duplicate copy of the order (blue) is an exact copy of the original and it is kept by the purchasing department. The triplicate copy (pink) is the accountant's copy. It is the same as the original copy except there are ruled columns so that the invoice cost, freight cost, and total cost may be noted against each article. The shipping instructions on the bottom of the order are omitted; instead is substituted the date received, space for the signature of the receiving clerk, and a space for remarks.

The quadruplicate copy (green) is exactly the same as the triplicate copy, and it gives the warehouse man the complete information for his cards. These are usually 5x7 in. and show at the top of the card the name of the supply, under the noun always (that is, Wrenches, Stillson 10"), and the minimum stock supply to be kept on hand. This figure is made up from experience and it gives the warehouse man a reminder so that when his stock reaches the minimum he can then requisition on the purchasing department for a further supply. On the main body of the card are columns headed as follows: Quantity, Date Received, Firm, Invoice Cost, Freight Cost, Total Cost, Unit Cost, Distribution, Total, On Hand.

These cards if carefully kept and periodically checked will give all the necessary information and afford a complete inventory at all times.



Creighton mine, of the International Nickel Co., in the Sudbury district, Ontario

Marketing of Fuller's Earth

A Clay Invaluable in the Bleaching of Mineral and Edible Oils

By Arthur B. Parsons
Assistant Editor

THE VALUE of fuller's earth arises from its unusual proficiency in adsorbing basic coloring matter from oils. It is used to bleach or decolorize and clarify oils of vegetal, animal, and mineral origin. The consuming industries divide themselves into two groups, according to the methods in which the bleaching is usually accomplished and the character of the earth required. These groups are: (1) the edible oils, including vegetal and animal, and (2) mineral oils, or petroleum products. Table I shows the principal oils and a few other substances in the refining of which the earth is used. Small quantities also are used as an ingredient in sundry soaps and toilet preparations, in drugs, for various purposes in chemical laboratory work, as a carrier for pigment in cheap coloring material, and as a water "softener." Producers are working to develop uses of the earth for other purposes.

Table I—Oils That May Be Decolorized by Fuller's Earth

Mineral	Vegetal	Animal
Kerosene	Linseed	Lard
Neutral	Rape	Tallow
Cylinder	Castor	Bone
Stock	Cottonseed	Whale
Petrolatum	Palm nut	Seal
Paraffin wax	Peanut	Fish
Ceresin	Cocoanut	Fish stearine
.....	Poppy seed	Beeswax
.....	Olive	Skin glue
.....	Mustard seed	.....
.....	Soya bean	.....

The value of particular earth cannot be foretold by a chemical analysis. Essentially, fuller's earth is a hydrous aluminum silicate with an extremely wide range of chemical composition. Iron, lime, and magnesia are usual constituents, whereas soda and potash are not prominent. A good earth always gives an acid reaction to litmus, but this is because of the property of adsorbing bases in the same way as it adsorbs basic coloring matter. Table II shows a number of typical analyses.

Table II—Typical Analyses of Fuller's Earth From Different Sources

	A	B	C	D	E	F
Silica, per cent	54.0	58.66	33.86	62.83	54.60	56.53
Alumina, per cent	18.6	17.33	35.11	10.35	10.99	11.57
Ferric oxide, per cent	4.7	7.21	14.21	2.45	6.61	3.32
Lime, per cent	7.0	3.17	7.04	2.43	6.00	3.06
Magnesia, per cent	2.3	3.26	1.48	3.12	3.00	6.29
Potash and soda, per cent	1.8	1.63	1.14	0.94	.....	1.28
Water combined and mechanical, per cent	10.6	8.74	7.12	14.13	17.75	17.95

A, B, and C, Surrey, England.
D, E, and F, Florida.

The only reliable method for determining the value of a particular earth for bleaching a given oil is a laboratory test under conditions approaching those of large-scale operation as nearly as possible. Physically, the earth is like ordinary clays, except that its plasticity is generally low. On account of its extreme porosity it has an apparent low specific gravity, although its true specific gravity is not different from that of other clays. A great variety of shades of color, including gray, green, olive, cream, blue, and yellow, are found, but drab is perhaps the most common. The adsorptive quality of the earth is magnified by the physical structure; it is an aggregate of grains, probably approaching colloidal state, thereby exposing an immense surface for adsorptive activity.

Only the United States and Great Britain produce appreciable quantities of fuller's earth. The output of the United States has been increasing and that of Great Britain decreasing in recent years, as indicated in Table III. The industry is an old and established one in England, and a large export trade to the United States still exists, although it is much less than before the war. The imported product at eastern seaboard ports must stand the freight from the British mine to London, an ocean rate of about $4, and an import duty of $3.25 per ton of 2,240 lb. The current (November, 1924) price is about $25 per ton of 2,000 lb., duty paid, at port of entry. The price includes the bags, and in that respect differs from the prices quoted by domestic producers. The latter can undersell the importers, and would get the business except for the reason that the imported earth is considered by some users to be superior for bleaching many of the edible oils. This point will be mentioned later. No British earth is used in the petroleum-refining industry in this country, and large quantities of American earth are exported for use in petroleum refineries abroad.

Table III—Production of Fuller's Earth in Short Tons

From U. S. Geological Survey

	United States	Great Britain	Total
1913	38,594	35,402	73,996
1914	40,981	42,405	83,386
1915	47,901	32,814	80,715
1916	67,822	32,599	100,421
1917	72,567	31,266	103,833
1918	84,468	26,085	110,553
1919	106,145	24,290	130,435
1920	128,487	28,906	157,393
1921	105,609	20,242	125,851
1922	138,944	.....	.....
1923	149,134	.....	.....

Florida is the principal producing state; Georgia is second, and the other states in which deposits have been developed are Arkansas, Texas, California, Illinois, Pennsylvania, Alabama, and Massachusetts. Georgia fuller's earth is used for bleaching vegetal oil, and that produced in Arkansas is suitable for treating edible oils. The Florida product, on the other hand, is used particularly in mineral-oil refining, for which it is especially suited on account of its high porosity or "specific volume."

A brief description of the two methods of using fuller's earth will reveal the characteristics necessary to meet the requirements of each process. Whichever the method employed, the earth and the oil should be free from moisture.

Two Methods of Utilization

Mineral oils, except kerosene, which may be treated by the mixing and filtering method, are leached by percolation, with or without pressure, through a column of granular fuller's earth in tall cylindrical vats. These vary from 6 to 18 ft. high, the longer column naturally giving the more complete bleach. The operation may be either cold or hot, depending upon the character of the oil; heavy oils require heating to afford the fluidity necessary for percolation and handling. The same

charge of earth is used until the bleaching becomes unsatisfactory, 250 bbl. of oil to the ton of earth being an average figure for medium oils. The earth is usually revivified by washing with naphtha and heating in a rotary kiln at a low red heat. As many as a dozen re-heatings can be made before the earth reaches a condition where it is no longer economical to revivify it.

The principal requirement aside from its capacity for adsorption of coloring matter is the uniformity of grain size, which permits satisfactory percolation. Excessive fines are undesirable. The usual grades are between 16 and 30 mesh and between 30 and 60 mesh, though a still finer grade is sometimes used. The most satisfactory size for treating a given oil is determined by test. The Florida earth is particularly suitable for this work because of its extreme porosity and because of the fact that it granulates well and the granules retain their size. The British earth, on the other hand, tends to pulverize easily and is therefore not suitable. An important feature is the machinery used to crush the earth; mills that crack rather than grind are obviously preferable. Even for the finer sizes used in edible-oil work grinding machines of the attrition type are to be avoided. Roller mills, tube mills, and ball mills are in this class. Screening is obviously necessary to grade the products.

The essential steps in the bleaching of edible oil by the mixing and filtration method are: (1) Preliminary treatment with hot alkali to remove fatty acids and convert the coloring matter to basic form; (2) introduction of a definite proportion of ground fuller's earth and stirring of the charge by means of mechanical agitators or compressed-air jets; (3) filtration, while still hot, usually through a pressure filter of the plate and frame type. Vegetal and animal oils are sometimes treated by leaching, but usually the agitation method is preferable because of the ease with which it can be controlled.

The quantity of earth used varies greatly, the range being from one-half of 1 per cent and 10 per cent, but usually between 1 and 5 per cent, depending upon the oil and the quality of the earth. Only a brief period of agitation is necessary, from ten to forty-five minutes being recommended. As much oil as possible is displaced in the press by steam or hot water, for the earth is not re-used and the oil remaining in the residue is lost. The use of air is not advisable.

Characteristics of Good Edible Oil Bleacher

The characteristics which are sought in an earth used for this purpose are (1) that it shall bleach well and that the oil shall not revert to its original color; (2) that it shall filter well and not cake badly; (3) that it shall leave no permanent disagreeable taste or odor in the oil; (4) that the quantity of oil retained in the spent earth shall be small; and (5) that there shall be no spontaneous ignition either in the filter press or in the waste pile.

The most important advantage claimed for the imported British earth is that, even when ground to 100 or 120 mesh, it filters well and retains a minimum quantity of oil. As a matter of fact, there are probably deposits in this country that, with careful mining and preparation, could produce equally good earth. The British product is uniform, carefully kiln-dried and properly ground, and users feel that they can rely on it. An excessive temperature in drying may injure an earth for edible-oil treatment, and this is carefully avoided by the British producers. The domestic producers are faced with this competition; if their raw material is as good their problem is to prepare it properly and convince the consumer of the high quality of the product.

The average value of the earth produced at domestic mines during recent years as given by the U. S. Geological Survey is as follows:

Year	Value	Year	Value
1911 to 1915	$9.71	1919	$18.83
1916	10.42	1920	19.51
1917	10.64	1921	18.69
1918	13.57	1922	16.48

The following quotations represent prices of Florida earth f.o.b. cars at the mine as given by a producer as of May, 1924. The figures apply only to carload lots, occasional smaller consignments commanding a higher price. Bags are extra unless returned to the mine. The actual prices paid by large regular customers are no doubt considerably below these.

Mesh	Price per Ton	Mesh	Price per Ton
16 to 30	$16.50	60 to 100	$14.00
16 to 60	18.00	Minus 100	7.50 to 8.50
30 to 60	18.00		

The reason for the lower price for the finer sizes, especially the minus-100, is that the demand is not large. Unfortunately, it is impossible to prepare the coarser sizes without producing more of the finer than can be marketed at a higher price. As a matter of fact, a surplus of minus-100 material accumulates at some of the mines without a market, although the proportion of fines produced has been reduced materially in recent years. One of the problems that face the industry is to develop a wider market for this material.

The United States uses about 90 per cent of the world's production. The consuming points are where the petroleum refineries are situated; that is, along the mid-Atlantic coast line, in Pennsylvania, Ohio, the mid-continent states, Texas and Louisiana, Wyoming and California. As the product is a comparatively low-priced commodity, freight is an important element in the cost and geographical location of a deposit is important. The Florida earth, however, goes to nearly all the oil refineries. California plants get cargoes through the Panama Canal, and the refineries in New York and New Jersey are supplied by boat. Most of the developed mines in Florida are owned, or are controlled indirectly, by the big oil companies, and the production by independent companies is not important. Shipments are made in carload lots of 135 lb. bags directly from the mine to the refinery. The smaller oil-refining companies make purchases at first hand from the producers, and shipment is made direct from the mine.

Packing Plants Large Consumers

Earth for edible-oil treatment goes to plants situated in virtually all of the industrial centers east of the Mississippi, the largest consumers being the packing companies situated in Chicago, Kansas City, St. Louis, Cincinnati, and Omaha. Large cotton-seed oil refineries, situated at Savannah, Ga., and particularly in the New York district, are important consumers. About six importers, all with offices in New York, do virtually all of the British business. One firm represents the Fuller's Earth Union in London, and the others deal with independents. The earth is dried, ground, and bagged in England and is shipped on a low rate as ballast. Burlap bags containing 200 lb. are customarily

used. Ports of entry on the Atlantic Coast depend in some instances on the ultimate destination. Rail shipments to large buyers are in carload lots of bags or barrels. Broken lots are often sold, though, of course, at higher prices. Sizes most frequently sold are 80 to 100 mesh, which is suitable for cottonseed oil; and 100 to 120 mesh. The latter commands a premium of 50c. per ton. Grades up to 160 and 180 mesh may be obtained, the price being a matter of negotiation between buyer and seller. Quantity, however, is a more important factor in determining the price than the fineness of the product.

One large producing company in Florida has a New York sales agency that handles exclusively sales for edible-oil purposes. These agents have built up a good domestic business and even export some earth. The earth mined in Georgia, Arkansas, and Texas is used for vegetal and animal oils, some advantage being derived from lower freight rates to Mississippi Valley packing houses.

Empirical methods have been devised for comparing two samples of fuller's earth in the laboratory so as to determine the relative economy of using a higher- or lower-priced material. There is no accepted standard; each particular oil presents a different problem. The object of testing is to determine the cost of producing a pound of acceptable bleached oil, taking into account the cost of the fuller's earth needed, the value of the oil lost in waste, and the cost of operation.

The United States has a virtual monopoly of the production of earth for refining mineral oils, and domestic producers have made great inroads in the importers business with the edible-oil industries. Further progress will depend in large measure on improvements in technical control of production and preparation and the development of better marketing methods.

Ontario's Silver Production Shows a Decline

Silver production for the first quarter of 1924 in Ontario shows a decline from the 1923 figures, explained in part by the absence of shipments from Gowganda, where work at the Miller Lake O'Brien was concentrated on development and at the Castle on mill construction. Work on other Gowganda properties is being vigorously prosecuted. Attention has been focused on South Lorrain, where the Keeley is producing 150,000 oz. of silver per month. Lorrain Trout Lake is now producing, and on the Canadian Lorrain (Maidens) and Lorrain Consolidated ore has been developed.

Companies shipping more than 200,000 oz. of silver are given in order; Nipissing, 770,866; Keeley, 452,051; Mining Corporation, 385,825; and Coniagas, 256,094. Shipments as reported by the T. & N. O. Ry. were 638 tons to the Deloro smelter, 526 tons to the United States, and 273 tons of residues to Germany.

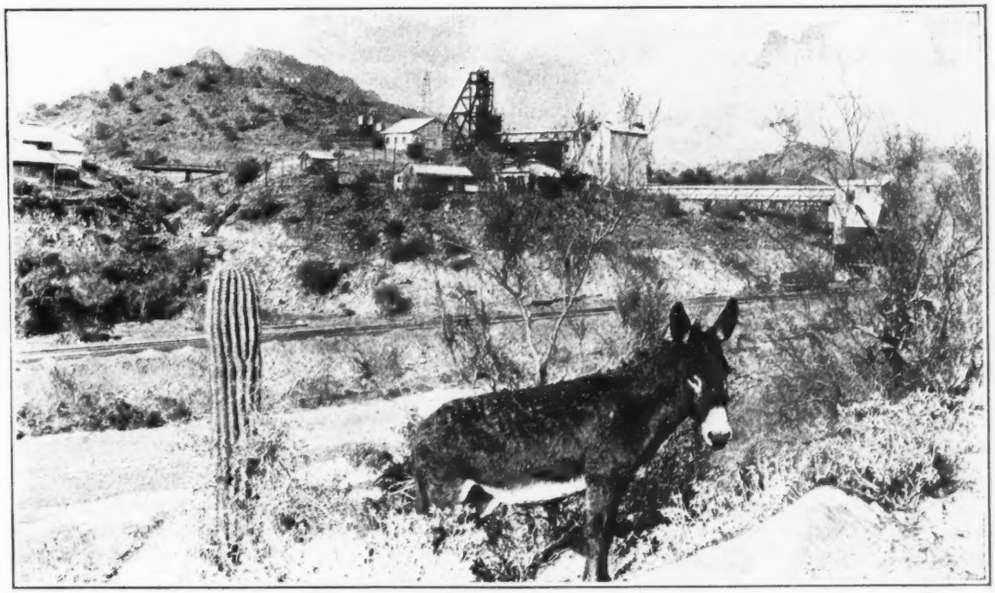
The average New York price of silver was 63.921c. per ounce, compared with 65.485c. for the corresponding quarter in 1923.

Details of silver output follow:

	Ounces	Value
Cobalt	1,747,504	$1,113,205
South Lorrain	601,660	380,020
Gold refining	45,846	29,203
Nickel-copper refining	16,322	10,266
Totals	2,411,332	$1,532,694

Refineries—During the quarter, ore, concentrates, and residues were treated at Deloro and Thorold for the recovery of silver, arsenic, cobalt, and nickel; also oxides and salts of cobalt and nickel. There was a production of 1,372,886 lb. of white arsenic, of which 902,635 lb. was sold. The total value of cobalt marketed in various forms was $490,332.

In Arizona—Copper, Cactus and the Nightingale



One of the Ray Consolidated shafts in the background. In the foreground, one of the Copper State's sweet singers, once known on the Comstock as the Washoe canary

Plant of the Humboldt Sulphur Co., at Sulphur, Nev.

A Novel Sulphur Enterprise in Nevada

Ore Mined From Surface and Underground—Ingenious Process for Steaming Out the Sulphur

By A. J. Crowley
Mining Engineer, Brooklyn, N. Y.

THE story of the sulphur deposits at Sulphur, Nev., now owned and operated by the Humboldt Sulphur Co., dates to the early 70's, when, it is related, an Indian traded them to a white man for a mule —which he never received. There are plenty of evidences, however, which justify the supposition that the district was a very popular "medicine hole" with the Indians prior to the arrival of the white man. The Indians evidently combined relaxation with business, for arrowheads, made from local obsidian and flint, are very plentiful in the neighborhood.

The names of the claims, under which the Sulphur deposits are patented, are Sheol No. 1, Sheol No, 2, and so on, which would lend color to the belief that at one time they were owned by one of Jewish persuasion who possessed a sense of humor, "sheol" being, I believe, the Hebrew equivalent of "hell."

Actual operations, and production of sulphur, began somewhere between 1870 and 1880, the product being hauled 35 miles to Humboldt House, a station on what is now the Southern Pacific railroad. From this point it was distributed, some of it going as far east as Maine. The production from this time on, averaged about 1,500 long tons per year. In 1911 the Western Pacific railroad, from San Francisco to Salt Lake City, was completed, and the main line now passes within a mile and a half of the mines.

The deposits are on the northwest flank of the Kamma Mountains, which overlook a branch of old Lake Lahontan, now the Black Rock desert, and cover an area two and one-half miles long and one mile wide. The methods of mining vary with the nature of the deposits. Where the depth of the overburden is not too great, it is plowed and scraped off with tractors and teams, and the ore is quarried. When conditions make this method impracticable, tunnels are run in at a point as near the toe of the deposit as is possible; from these the ore is crosscut to its extremities, wide rooms being mined and small pillars being left. The final operation is the caving in of the pillars, allowing the soft surrounding formation to fill in. Little or no timber is required, and during the entire history of the mine, which is one of almost continuous operation for fifty years, there has been only one fatality, and in this case the owners were exonerated entirely. Conditions underground are excellent; there are no gases and no water interferes with operations.

When I took the management of the mines and arrived at the camp in August, 1917, I found the mill burned to the ground and two of the mines on fire. German incendiaries were blamed for the fire at the mill, and this, at the time, appeared reasonable enough, but later experience pointed to carelessness as the cause. The mine fires were smothered by bulkheading the entries, but these fires were frequent and expensive. A thorough investigation was started, and the main cause was found to lie in the careless placing of drill holes, and in using rags and burlap as stemming; also, a contributory cause was the failure to wet down the floors and pillars thoroughly. Considerable assistance in overcoming the fires was rendered by the Hercules Powder Co., which recommended a special explosive.

By bringing a water line into each mine, wetting down was simplified, as prior to this it was necessary to carry water in buckets. Clay was supplied, replacing rags and burlap, and three oxygen masks were provided, so with the water pipes installed in the mines, and the masks at hand to permit access to a mine fire, fires soon became minor difficulties.

The sulphur is in elemental form, and visitors go into

rhapsodies over the beauty of some of the workings, which are sparkling, yellow crystals.

The sulphur content of the ores varies from 15 per cent to 85 per cent and in a few of the deposits there are masses of pure sulphur which have the appearance of having been deposited in liquid form, rather than by deposition from ascending gases.

A large number of the deposits have been developed, but only since 1917 has any work been done to ascertain if the ore continues below the present working levels. Development in the past was carried on in such a way that all of the ore mined could be run by gravity to the mill. Careful investigation, however, showed that in not a single instance had any attempt been made to follow the ore down. The results of the development work since 1917 have led to the conclusion that the major orebodies are as yet untouched.

The processes used in the past for recovery of the sulphur have been extremely simple, and the resulting product was of a very high grade, but the recovery was poor, being less than 50 per cent. As a result of long-continued operation with this method, there are large dumps of waste material containing from 13 per cent to 27 per cent sulphur—probably 150,000 tons in all.

The operation was carried out in cast-iron pressure chambers; these chambers, shaped like an egg, were approximately 10 ft. high, and 5 ft. in diameter at a point 7 ft. from the top. On the inside, at this point, a perforated, cast-iron grate, made up in four sections, divided the chamber into two parts. The chamber was filled from the top and the charge, consisting of three tons of ore, was carried on the grate. On a level with the grate was a door for the discharge of the waste resulting from the treatment. When the chamber was filled, the top and side doors—fitted with gaskets and designed somewhat like boiler handhold plates—were closed and held in place by 1½-in. screwbolts.

Steam at 60-lb. pressure was then turned into the chamber at the top; this steam carried to the grate and through the perforations the major portions of the fines. As the pressure began to build up, a valve in the bottom part of the chamber would be opened occasionally for the purpose of discharging the material that had passed through the grate, together with the water resulting from the condensing steam. At a temperature of 239 deg. F., the sulphur would melt and run down through the ore, into the settling tank.

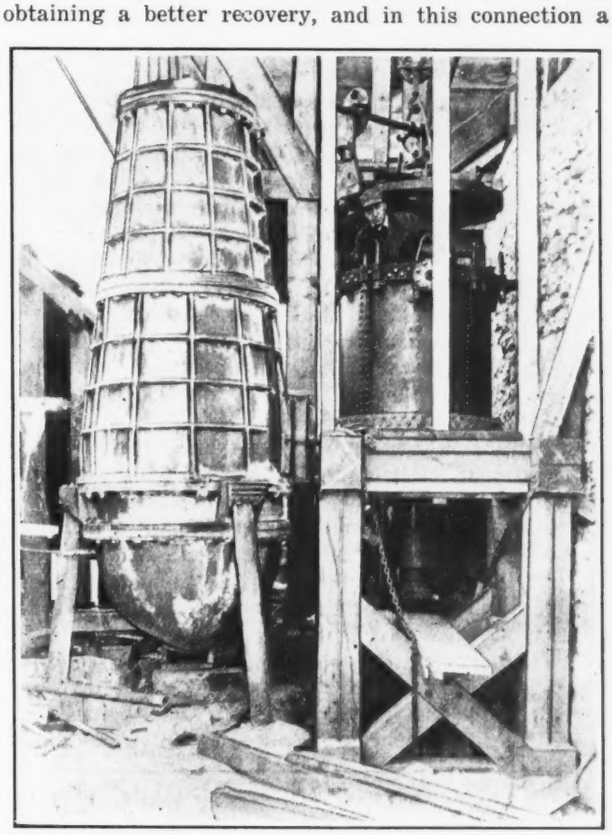
The average time required to liquefy a charge was fifty minutes, and a complete cycle—loading, steaming, and discharge—took one and a quarter hours. When the treatment was completed, the valve in the lower chamber was opened, allowing the liquid sulphur to flow off into a settling tank, in which it was kept at a temperature slightly above the melting point for several hours, for the purpose of eliminating any surplus moisture and to allow any inert matter either to float or to settle. From this tank the sulphur was run off into molds, each with a capacity of 250 lb.

In this lump or crude form, a part of the sulphur was shipped, but the major portion was crushed to 80 mesh and packed in sacks containing 110 lb. Sulphur in this form had a market value almost double that of the crude, and the cost of the crushing and sacking was relatively small. The crusher, which has been in operation for twenty-five years, is one of the beater type, and has rather an extraordinary capacity, turning out as much as 365 sacks of 110 lb. each in ten hours, or 40,150 lb., using only 6 hp. There is no record of the maker's name, nor any record of the purchase.

Occasionally, this crusher would be damaged by an explosion, and for some time the resulting fires were a source of considerable worry, but in 1918 a few perforated steam pipes were installed in the crusher, the elevators, and the sacking boxes, and as soon as an explosion occurred a very small quantity of steam was turned through the pipes, which at once extinguished the fires. The first attempt to use this system almost resulted in disaster, as, instead of just cracking the valve, an excited mill man opened it wide, with the result that burning sulphur was blown to every part of the mill; "a pleasant time was had by all."

Improved Separator of Unique Design

In 1920 experimental work was started with a view to obtaining a better recovery, and in this connection a



Old extractor at left, new extractor at right

unique plan was tried, using centrifugal force to assist the flow of liquid sulphur from the ore, once it had melted. The separator, which was designed to carry a charge of 3,000 lb. of ore, consisted of a cast-iron pressure chamber 6 ft. in diameter by 5 ft. long, which was fitted with a pressure head and ring similar to that used on a Kelly filter. This head could be taken off, or put on and closed, almost instantly.

Through a stuffing box in the bottom, a 5 in. steel shaft, forked on the top, penetrated to the interior. The basket carrying the charge was of cast iron, with ⅜-in. perforations at intervals of 3 in., and so designed that it would set down over the forked shaft until the fork engaged a steel cross pin, which was set in the shaft sheath. This sheath was an integral part of the basket.

On the extension of the shaft, outside the chamber,

was a 20-in. pulley, and the shaft carrying the basket was mounted in a ball thrust-bearing. The motive power was a 6-hp. vertical steam engine connected by a belt to the shaft, and the entire unit was mounted on railroad springs, to allow for gyroscopic movement. Two baskets were provided, which permitted a charge to be loaded while one was being treated.

The cycle was as follows: The Kelly head was unlocked and hoisted on a truck fitted with 12-in. car wheels, and mounted on a track. The car was then moved 6 ft. to one side. The basket already in the chamber was hoisted out and lowered onto a truck, similar to that carrying the head, and moved to one side. The basket containing the fresh charge was then lowered into the chamber, the Kelly head replaced, and the engine started. In the meantime, the first basket was run into a tipple, dumped, and returned to its position below the ore bin, for recharging.

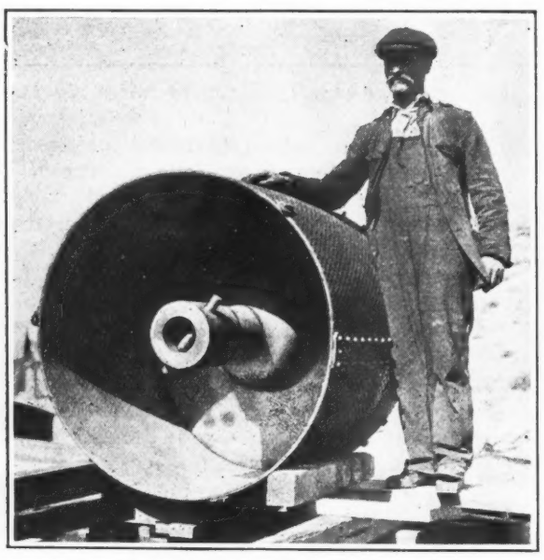
Short Cycle of Operations

Below the chamber was a settling tank, fitted with a valve, which, after the centrifugal had made a few revolutions, was opened for a few seconds to discharge any fines that may have been thrown out of the basket during the first revolutions and before the mass of ore had settled into place. The basket was run at 300 r.p.m.

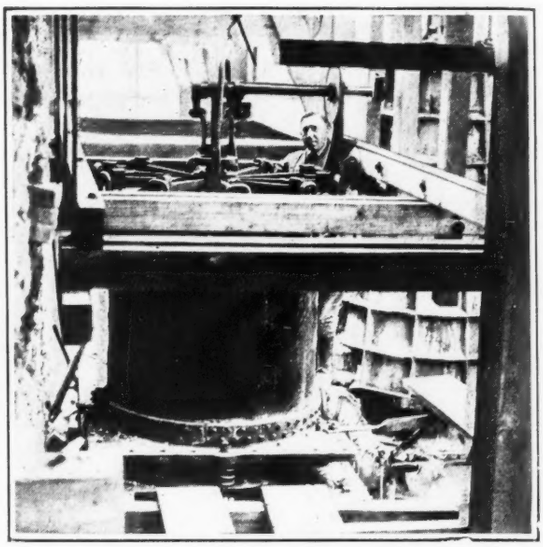
Approximately three minutes was required to bring the temperature in the chamber up to the melting point, two minutes to melt and discharge the sulphur from the basket into the chamber, two minutes to draw off the sulphur, two minutes to blow off the steam, and three minutes to change baskets—the complete cycle occupying twelve minutes.

The entire mill was run by three men, a fireman and two hoistmen; the hoistmen attended to the loading and unloading of the baskets, and also to hoisting and lowering them into the chamber. The fireman attended to the boiler and ran the centrifugal. With some mechanical improvements, and the addition of one more man, it would have been possible to operate a battery of three of the centrifugals.

This installation produced, on a commercial scale, for over a year, and would have been expanded had the attempt to increase the water supply at the mines been successful. It is now proposed to install a subliming plant, and for the last two years research work, having for its object investigation of the subject, has been conducted. Many difficulties have been encountered, but most of them overcome, and finances are now being increased, with a view to installing a plant capable of producing 10,000 tons of sulphur per year.



Centrifugal basket



Upper part of centrifuge showing Kelly filter

The markets for the sulphur produced at Sulphur are increasing rapidly. Considerable quantities are shipped to the sugar refineries in Utah, Wyoming, and Idaho, and a large tonnage goes to California and Oregon, where it is used for agricultural and other purposes.

The Panama Canal shipping records show that in the year ended in June, 1923, 117,000 tons of sulphur passed from the Atlantic to the Pacific, through the Canal, most of which went to the Western states. In addition to this, a considerable tonnage was shipped overland. These figures indicate that there is a good market for sulphur produced in Nevada.

Can He Do the Work Required?

Dr. Harlow Brooks, professor of clinical medicine in New York University, speaking before a recent meeting of the Conference Board of Physicians in Industry, pointed out that the employer, for his own protection, asks three questions when engaging workmen. They are: Can he do the work required? Is the worker subject to contagious disease which will endanger the health of other workmen? Is he liable to be frequently sick? In pleading for a betterment of physical diagnosis, Dr. Brooks said: "To a very considerable degree, when properly conducted, it can determine the character of labor for which a man may be fitted or for which he can fit himself. It is the chief basis in the exclusion of men suffering from contagious diseases which may develop into a serious epidemic in your factory or camp. It would tell you with no mean degree of accuracy those men who are most likely to suffer accidents either through their carelessness or indifference or because some other disability may endanger the safety of others. Since the employer is to a very considerable degree financially responsible even when injuries and accidents occur through the fault or contributory neglect of the workmen, it is of primary importance that those persons selected for positions should be first in relatively good physical state."

A Roughneck Report on the Arizona Apache Mine

By Dick Wick Hall, LL. & LBD.*
Salome, Arizona

Dick Wick Hall

THE Arizona Apache Group of Mining Claims, often very courteously and erroneously called the "Apache Mine," is located in the South West Corner of Hell, about 30 miles westerly from Salome, Yumaresque County, Arizona. If it were located in any other place — near Bisbee, Jerome or Globe, for example—Many Mining Engineers and Mining Men would undoubtedly think More of it, go Crazy or Wax Enthusiastic over it—if it is possible for a Mining Engineer to do such an Unheard of Thing. In its present location Most Mining Engineers Hesitate to commit themselves definitely or Risk their Reputation until Heaven or some Other High Authority has Guaranteed the Local Geology to be Correct and in Good Form. It occupies a position similar to Some Newly Rich Roughneck Miner trying to Break into Good Society. He may have Plenty of Money and the Apache may have Plenty of Rich Ore—but they simply Don't Belong, as Yet.

You often hear Ordinary Brained Individuals, in speaking of Well Known Men of Unqualified Standing & Position, brag that they knew him when he was Washing Dishes in a Restaurant and His Wife was a Ditch Digger. It is the same way with Mines. So many so-called "Mining Men" and mining engineers love to get together and tell of the days—the Good Old Days—when the United Verde, the Copper Queen, the Magma, Inspiration, and All the Other Good Mines, were Ten Foot Holes and "Turned Down" by such and such Engineers. Strange to say, no one Ever Yet heard one of these so-called "Mining Men" and mining engineers do any Bragging about some of the Prospects they themselves may have turned down or of any of the Rich Mines they themselves have made or opened up after some Other Engineer had turned them down. I often Wonder Why these so-called "Mining Men" and mining engineers don't do a Little More Constructive Work and Not So Much Destructive Criticism & Conversation.

I can best describe the Geology at the Apache by saying that it is "As Is"—just as God Made It, excepting where it has Been Scarred and Marred during the last 150 years by Human Beings trying to Rob Nature. I Guarantee the Geology of the Apache to be Natural and Confusing—the same as in Nearly all Other Real Mines. The property has been examined by 37 different Mining Engineers and Geologists and several hundred "Mining Men," starting with old Father Kino, the Spanish Priest who first discovered and mined it about 1782. Those who have examined or mined the Apache have several hundred & 37 Different Opinions about the Geology—and No. 2 Alike. Some say it is "like Bisbee"—others say it is "almost the same as Tombstone," or "just like the Mother Lode in Alaska"; and some say "they never saw nothing like it Nowhere Before." Some Think It Is and others Say It Ain't—and in the face of all these Conflicting Opinions I hesitate to express myself more definitely than to say that I don't think Any of them know Very Damn Much About It. I DO KNOW that there is a Lot of Hard Rock of Various Kinds in which there is Scattered Around at Various Unknown and Unexpected Places in a rather irregular Regularity quite a Considerable Amount of Very Rich Copper & Silver Ore which the Smelters are Always Anxious to pay $3,000 or $4,000 a Car for—whenever We and They can Get It—which Happens a Little Oftener than Presidential Elections but Not Quite as Often as Bi-Monthly Pay Days, much to our Regret.

The Only Reason the Apache Mine is not Taking Out Millions of Dollars' worth of this Rich Ore is because of the Sad Fact that there is Not Enough of It in any 1 Place so far opened up. Wherever this Rich Ore is found it has the Habit of Getting you All Excited and then Leaving you All Worked Up and Worked Out. Just when you have about 8 Feet of Solid Glance running Rich in Silver and Copper, it will quit you like a Flip Flapper does when your Money is Gone—and just when it Pinches Down and you feel Worse than it Looks, then it will Open Up Better than Ever and you think you have the World by the Tail—until it Quits Again and Goes Somewhere Else without leaving any word Where It Went. It's a Good Deal like Courting a Bashful Girl, if you can understand What I Mean.

We Follow the Ore as Fast and as Far as we can, a Method Taught us in the College of Hard Knocks & Short Rations—which, by the way, is one of the Best Mining Schools On Earth. Inasmuch as our Means and Money are Limited and Geologists say it took Several Million Years for all this Geological Action to Take Place, we seem to be laboring under Long Odds in trying to Keep Up With It, Unravelling this Tangled Skein of Nature. So far about all we have been able to do is to Scratch its Back close to the surface and Irritate It a Little—but Not Nearly as Much as it has Irritated us at Times.

According to the Best Authorities on Mining and Geology, all Good Mines have 1 or More Faults. The Apache must be a Good Mine, because it has Several Faults, Little Ones and Big Ones. Nearly Every One who sees it Finds Some Fault with it, among which I can Remember and Mention the following: "Too Far from the Railroad"—"Don't Run in the Right Direction"—"Ore don't Last in Limestone"—"Not Deep Enough Yet"—"In an Unproven District"—"Wagon Road is Too Rough"—"Ore is Too Rich to Go Down"—"Bunk House Too Far from the Shaft"—"Too Irregular and Broken Up"—"Not Enough Volcanic

*Which means "Let's Live and Learn By Digging."

Disturbance for a Big Mine"—"Too Close to Yuma"—"Price of Copper & Silver Too Low"—"Can't Be Much Good or Someone Else would have Found it Long Ago"—"The Bigger and Richer it is the More the Government will Take Away from You"; and so on until one almost gets Discouraged Trying. The Only Fault we haven't found yet is the Big Dividend Fault—and maybe Some Day, if we keep on working, we hope to find this one.

As near as I can determine from what several hundred and 37 different mining men and engineers have told me and from what little I have learned in 24 years' hard knocking, the Apache ore bodies occur in or along a large fractured zone in an area of limestone, shale and quartzite, near a large eruptive body of iron stained granitic porphyry. As in all other known ore bodies in limestone, the ore bodies at the Apache, so far as we have gone, are more or less irregular, generally More So, but Always Rich, running from 20 per cent to Over 40 per cent Copper and as high as 100 ounces silver to the Ton, in car shipments. How Much More of it there may be I don't Know, but about a quarter of a Million Dollars has already been taken from shallow tunnel workings, judging from all available records. If any Further Authentic Information is Desired, Ask the Creator. He made the Apache. I am simply trying to Follow the Trail He Left—and when he left all these Signs and Earmarks at the Apache, I DON'T BELIEVE HE LIED. Quien Sabe, sabe Dios!

The Geologic Time Scale

By Alfred C. Lane
Professor of Geology, Tufts College

FOR SOME YEARS, and indeed almost ever since it was known that uranium changed to radium and that in turn to something else, finally winding up with lead, it has been realized that a way was thereby opened to determine the time when the atoms of uranium were segregated from other substances into pitchblende or any such mineral, provided we could be sure that the lead always present in uranium minerals was formed from such decay of the uranium. This has been followed up by Shutt, Holmes and also by other investigators.

The formula used by Barrell and in Lefax, 9–358, was that the ratio of lead to uranium multiplied by seven and one-half billion years was the age of the mineral. Other similar methods of obtaining geological ages have been tried, depending on various minerals, on the presence of helium given off in the process of decay, on the discoloration of surrounding minerals (pleochroic haloes in mica as studied by Joly), and besides this in the recent deposits of tufa in Yellowstone National Park where the waters are radioactive. Schlundt and Moore found that the more recent the tufa the more radioactive they were, and, furthermore, that the age could be estimated thereby.

But the results from the decay of uranium and thorium were not altogether accordant. How far is this lead really derived from uranium, really itself stable, or derived from a hyper-uranium? These questions have not been settled. Moreover, the estimate from atomic decay gave results often tenfold larger than the familiar and interlocking estimates from recent erosion and deposition, and the total amount that has probably been done since the beginning of accumulation of sodium in the Pre-Cambrian sea. These all give results whose logerithm is 8.0 ± 0.3. It has therefore seemed wise for the National Research Council, Division of Geology and Geography, to appoint a Committee on the Measurement of Geologic Time on the Basis of Atomic Disintegration, A. C. Lane representing the Council, S. C. Lind the U. S. Bureau of Mines, R. C. Wells the U. S. Geological Survey, Dr. R. B. Moore, who is in business but is particularly familiar with helium gas and has done the work on radioactive decay above mentioned, and R. W. Ellsworth, of the Geological Survey of Canada.

This committee met in Washington during the meeting of the Geological Society of America and made arrangements for getting together whatever had been done and putting it in the hands of those interested. It found that W. O. Hotchkiss, the State Geologist of Wisconsin, had already started to concentrate the more radioactive granites, hoping thereby to distinguish them. It is obvious what a practical help it would sometimes be in a region of isolated exposures if outcrops of granite could be thus dated. The work had, however, been interrupted, first by war and afterward by changes in the staff. Plans were laid to see if it would not be worth while to renew this work.

At least one place was reported where there is a good chance that research work will find the reason for the discrepant results from uranium and thorium minerals. Prof. T. W. Richards finds that the lead from uranium has the atomic weight 206, ordinary lead 207, thorium lead 208. The next step is to locate enough material of definable geologic age so that sufficient lead may be obtained to get the atomic weight, and the committee would be very thankful for knowledge of such locations. Possibly some pegmatites might be found where the mining for quartz and feldspar had discarded an impure radioactive remainder in quantity.

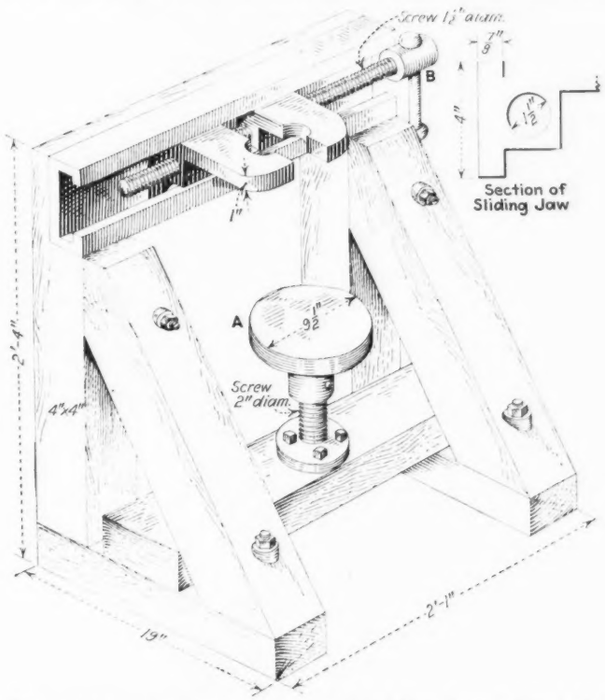
It would also be a great thing if some man of means could endow a research under the auspices of any institution in which he was interested, which in a few years would give us this new key to the arcana of the earth's past. It seems reasonably certain that with enough material, concentrated enough, the answer would be given.

Information regarding deposits of radioactive material, of pegmatite deposits, or of waste piles from the mining of pegmatite, of laboratories or individuals desirous of carrying on research along these lines, and of someone who wishes to immortalize himself by putting the chronology of geology on a definite basis, will be cordially welcomed by the committee, which may be addressed care of the National Research Council, 1701 Massachusetts Ave., Washington, D. C.

Useful Operating Ideas

Handy Rope Clamp

A portable rope clamp for forming and holding the loop of a hoisting rope about the thimble is shown in the accompanying illustration. The rope is looped and placed between the movable jaws, which are opened to their widest position. By turning the screw *B*, the loop is narrowed. At the same time the lower disk *A* is raised, lifting the looped part of the rope. The rope thimble is placed in position, and by alternately



Portable clamp for forming and holding loop of hoisting rope about thimble

raising the loop and narrowing it by bringing the jaws closer it is finally seated in the groove of the thimble. The free end of the rope is brought against the rope, and it is then ready for the placing of the rope clamps or for the splicing of the eye.

The jaws of the device consist of two castings which fit a cast-iron runway. The openings for the shaft are threaded, one with a left-hand and the other with a right-hand thread of coarse pitch. The rod is correspondingly threaded. The capstan head is keyed to the rod. The jaws are opened and closed by turning the rod.

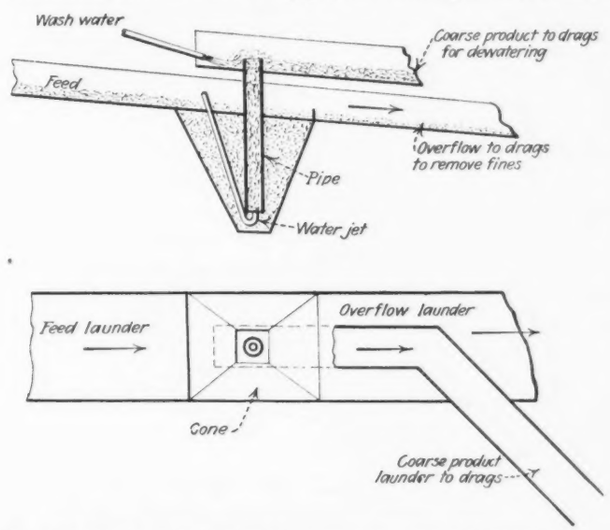
The lower part *A* consists of a wooden disk 9½ in. in diameter with capstan head attached. The vertical rod is threaded, as is also the disk attached to the three-inch board shown in the sketch. The advantage of the arrangement is that it can be brought to the job. The device was made in the shops of the Kennedy Mining & Milling Co. of Jackson, Calif., and is used in hoisting rope changes.

Water Jet Lift in Classification

By C. W. Tandy

At the Arthur plant of the Utah Copper Co. at Garfield, Utah, the device shown in the accompanying illustration was designed and installed for the purpose of classifying table concentrates delivered by a launder into two products, a coarse one to be used in acid making at the smelter and a fine one to be used for mixing with thickened flotation concentrates.

The first proposal to accomplish the foregoing objective involved the delivery of the table concentrate to a drag classifier, the oversize to be sent to one side of a horizontal belt conveyor and the overflow containing the fines to be sent to three drag classifiers, the fines being discharged upon the other side of the belt conveyer. The overflow from the three drag classifiers was carried by a launder to a bucket elevator and discharged into the thickener used for the flotation concentrates. Such a plan required the removal and rebuilding of three concrete drag classifier tanks and the construction of launders to the bucket elevators. The estimated cost was $3,000. Attempts were also



By this arrangement table concentrates delivered by a launder are classified into two products

made to utilize gravity classifying cones in the launder ahead of the drag classifiers, but this proved impracticable, as the coarse product was discharged at a level lower than the feed inlet of the drag classifier.

Another plan was then tried. A water jet was arranged to discharge into a lift pipe placed vertically in the cone classifier as shown in the sketch. The coarse product settling in the bottom of the cone classifier was thus lifted to a sufficient height to a second launder which delivered to the first or dewatering drag classifiers. The overflow from the cone classifier was distributed to the second, third, and fourth drag classifiers. The dewatered coarse concen-

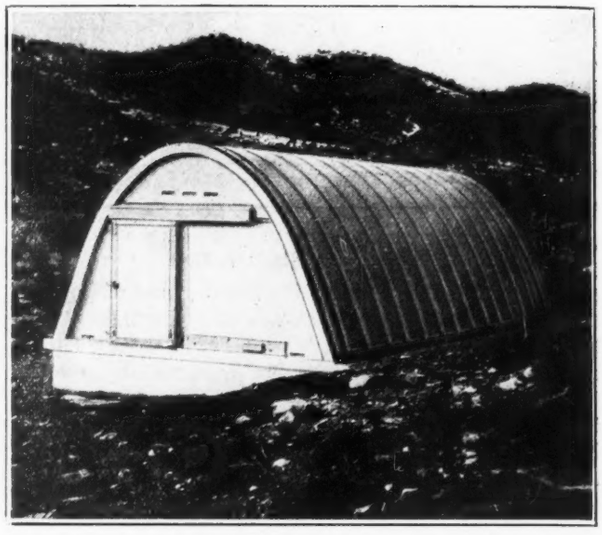
trates from No. 1 were delivered to one side of the conveyor belt and the products from No. 2, 3, and 4 to the other side of the belt conveyor. The overflow from the drag classifiers was laundered to the bucket elevator. The cost of the cone and water jet attachment did not exceed $150. The classification resulting proved satisfactory. The control of the quantity of smelter product was accomplished by varying the number of cone classifiers in use. A. F. Lyster assisted me in working out the details of the installation.

Tracing or Copying Table

By S. H. Paine
Chief Engineer, Elm Orlu Mining Co., Butte, Mont.

The accompanying line cut illustrates the construction details for a tracing table that has proved satisfactory. The top is made of $\frac{5}{16}$-in. plate glass, with edges of 2-in. sugar pine, rounded and arranged so that $\frac{1}{16}$-in. clearance is left between the sides of the glass and the wood, for felt packing. The inner part of the top frame is rabbeted $\frac{5}{8}$ in. wide and to the depth of the glass ($\frac{5}{16}$ in.) plus $\frac{1}{16}$ in. allowance for the felt on which it rests. The top surfaces of the table must be flush. The table legs and braces are 3x3 in.; the side and end pieces, 1½x4 in. The end boards are cut from ¾-in. material, according to templet.

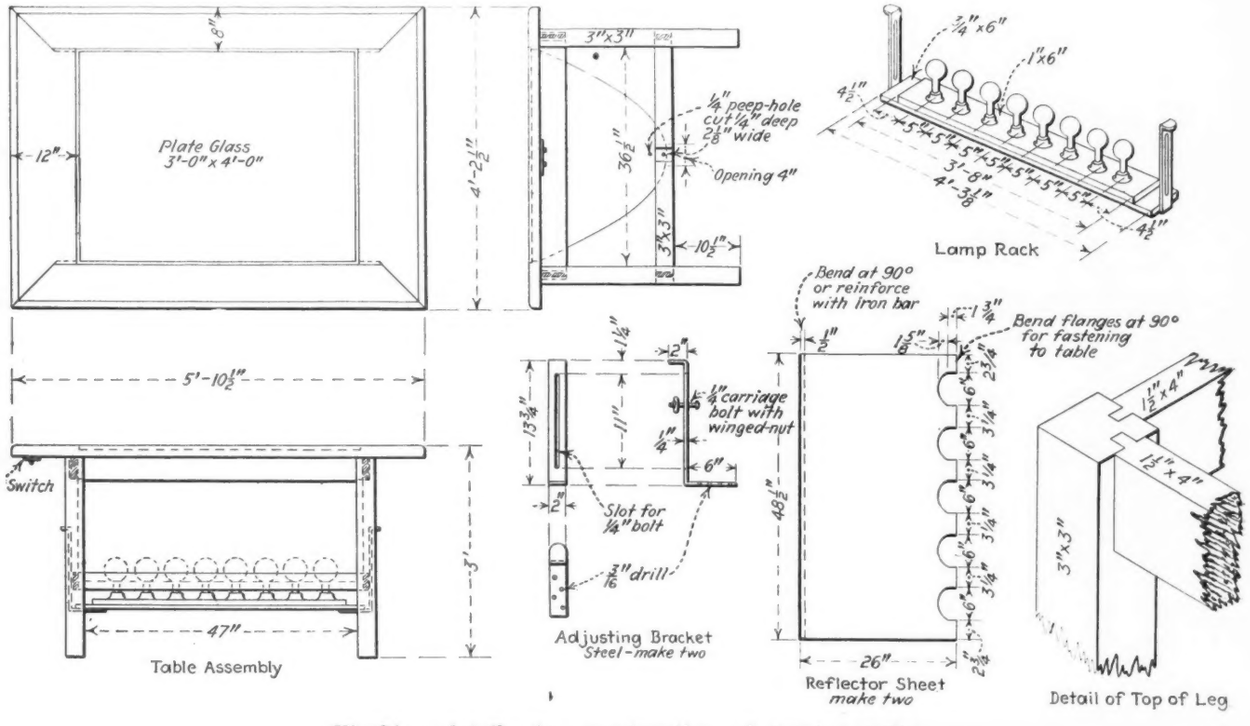
Reflected light is directed perpendicularly to the plate glass by means of a parabolic reflector, of 28-gage flat galvanized iron, the focus of which contains the source of the light. The method of construction of this and data for the determination of focus may be found in most engineering handbooks. A ¼-in. hole is drilled at the focus for sighting through and for lining up the filaments of the lamps. To obtain a good fit, the reflector should be laid out in the drafting office. An opening 7 in. wide will be obtained if the sheet is 26 in. wide. A 4-in. opening is ample; but, if used, a wider sheet is necessary.



Powder magazine built of concrete. Note the catenary shape of the roof

A Concrete Powder Magazine Designed to Lessen Risk from Explosion

The Chief Consolidated Mining Co., of Eureka, Utah, uses a powder magazine constructed of concrete which is so designed that if an explosion should occur in it the structure will disintegrate into small fragments that will not endanger surrounding buildings. To attain this and to facilitate construction no large aggregates were used in the concrete mixture. The house has the shape of a catenary, which allows for the least possible amount of reinforcement. The roof is covered with a composition material. The door is also made of concrete. It is shown in the photograph on this page.



Working details for construction of tracing table

Discussion

Colorado's State Testing Plant

THE EDITOR:

Sir—I have been requested by the Mining Bureau of the Denver Chamber of Commerce to send you a copy of the following resolution, which was today passed unanimously:

"Whereas, there has been brought to the attention of the Bureau an extraordinary editorial in the *Engineering and Mining Journal-Press* under date of Oct. 11, 1924, entitled 'The Socialistic Trend'; and

"Whereas, the said editorial seems to be based on an entire misapprehension as to the purposes and procedure of the Colorado State School of Mines Testing Plant, the purpose of the plant being primarily educational; however, not alone confined to the student body, as others interested in advancing mining and metallurgical science may also benefit. Use of the plant with its elaborate equipment is open to all, being a practical means through which engineers and operators can work out their problems alone or in conjunction with the professional talent in plant charge. It is apparent that the editorial confuses 'by' with 'at', inasmuch as the newspaper item quoted says specifically 'at' and not 'by' the plant:

"Now, therefore, be it resolved that this Bureau goes unanimously on record as endorsing and commending without reservation the experimental plant and its work. We wish further to state that considerable inquiry has failed to disclose a single engineer who feels that his work has been cut into by the state institution, and in fact we have so far failed to find a single engineer who is not enthusiastic about the value of the work being done there, about the opportunities afforded him for the use of the very complete and expensive equipment therein contained at the most nominal fee, and who does not feel that the experimental plant is one of the most practical factors in the rejuvenation of mining in the State of Colorado.

"Be it further resolved that we condemn any unjust criticism which, in the interests of some supposed but entirely mythical engineers, will tend to hamper the constructive work so efficiently started, and which has already helped to increase the business of all the engineers in the state, to say nothing of the assayers and metallurgists, and which, through its beneficial effects on the mining industry as a whole, will help the engineering profession more than any other single factor which has come into existence within late years."

Denver, Colo. M. B. TOMBLIN, Secretary.

John Taylor & Sons Not in Anglo-American Mines

THE EDITOR:

Sir—A slight inaccuracy occurred in the *Engineering and Mining Journal-Press* in the issue of Oct. 4. On page 550, under "Toronto Letter," the writer states: "The assets of the New Rhodesian Mines & Investment Co., Ltd., are being taken over by the Anglo-Ontario Mines, Ltd., which is a Canadian exploration company, financed by John Taylor & Sons, of London, and their associates."

May I point out that Messrs. John Taylor & Sons are not connected with the Anglo-Ontario Mines, Ltd.? The company they are associated with is the Anglo-Canadian Explorers, Ltd. W. C. BAYLEY.

London, England.

Minor Crustal Movements and Ore Deposits

THE EDITOR:

Sir—In a recent article written by myself, in *Engineering and Mining Journal-Press*, it was maintained that mineral districts containing ore deposits of the epigenetic type frequently, if not commonly, occur at the junction of fracture zones. Such fracture zones as were discussed were those that evidenced themselves by the presence of mountain ranges, or ridges, or other topographical features along their courses. These intersections necessarily resulted in regions of excessive weakness in the earth's crust, producing a condition which is common enough in the mineral districts of the world, manifesting, as they do, evidence of unusual movement or faulting between the numerous rock blocks that make up the earth's crust at such points.

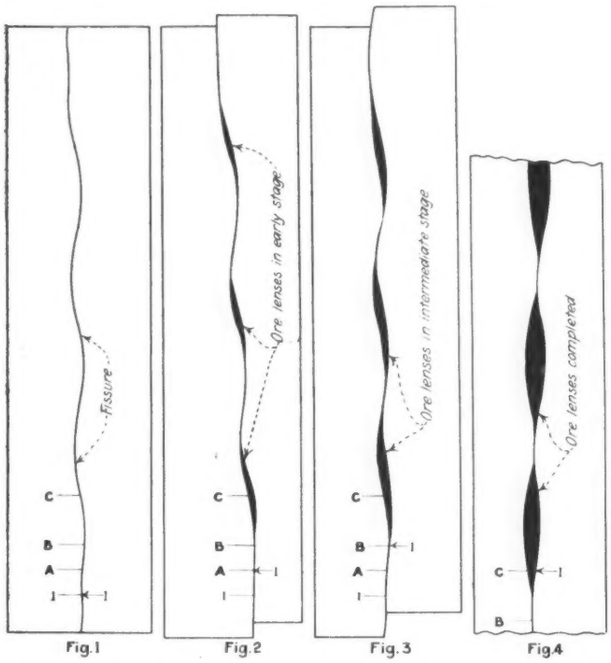
Mineral districts are often described as regions of disturbance; but it may be questioned if ores are formed during periods of violent movement. Short slips and faults seem to be the invariable accompaniments of ore deposits. This condition constitutes one of the commonest peculiarities of mineral districts and indicates long periods of unsettlement or instability. It appears probable that this unsettled condition is an essential factor in the formation of ores. Perhaps the most important reason for this belief is that solutions laden with mineral matter, as they precipitated their burden and filled the channel with ore and gangue, would choke the opening against further flow. In a highly unstable region, however, slight recurrent movements in the opposite walls of the fissure would reopen the channel. This process in its simplest form is not difficult to realize, as such movement must either rupture the deposited material, or break it loose from one wall or the other.

When veins are observed filled from wall to wall with ore and gangue, it is natural to assume that the walls were their full distance apart during their entire period of mineralization. That this belief may not be well founded will be realized from a study of the figures on page 782, which are views from a cardboard model. The figures numbered 1 to 4 are representative of a section of country rock which has been divided by a line of fissuring. These figures show what must take place when the walls upon the opposite sides of a fissure move with reference to each other. This is based on the fact that the walls of few, if any, fissures are perfectly straight, and that bends, or bulges, or depressions, in one wall or both walls will produce effects analogous to those herein outlined.

In the illustration, in order to keep within a reasonable space, the bends in the assumed fissure have been exaggerated beyond what is likely to be found under natural conditions, and instead of being pronounced and regular undulations, as here shown, are more likely to be a bend or bulge of one or two feet in a length along a wall of perhaps one to several hundred feet.

Fig. 1 shows the cardboard after having been severed

along the supposed line of fissuring, but with the two walls in their original position, the line 1-1 being continuous across the fissure. We will suppose the figure to be viewed from above—that is, as a plan view. Obviously, until there has been some material movement



Four positions of cardboard model showing successive stages of development of ore lenses

between the walls, there is but little opportunity for the circulation of solutions through such a crack, and a very slight deposition of gangue would easily choke whatever opening might exist. We will now suppose that the straight line marked "1" on the right side of the fissure is moved so that it is in line with "A" on the left side, as is shown in Fig. 2, keeping the edges of the right and left sides pressed together with a maximum number of points touching. It will be seen that open spaces have begun to appear such as would be well adapted for the flow of solutions. We will suppose that these open spaces become filled with precipitated material. Another movement of line "1" to a point opposite "B," as in Fig. 3, would again result in a reopening, and also as line "1" moved to position "C" in the drawing where the maximum opening, as in Fig. 4, would appear. If the space resulting from this last movement became filled with hard material such as quartz, and the movement was later continued, the walls of the fissure would be forced still further apart, as the bulges would come in contact with the lenses of gangue which have been deposited in the fissure, and the vein would become continuous instead of a series of shoots.

Short movements have been emphasized because rocks at considerable distance below the surface are necessarily under pressure. It seems certain that large movements with the rocks under great pressure would grind away bulges such as shown in the above figures, permitting the walls to approach closely at all points. This would necessarily produce considerable quantities of powdered rock, or gouge, in the presence of moisture, which would be forced into any open spaces that might still exist. Under such conditions it is not likely that channels would be left for the flow of solutions.

Evidence that such short movements are of common occurrence will hardly be needed by those who have had much experience among ore deposits. Banded structures in veins have already been attributed to the "Repeated opening of fissures." This expression necessarily implies repeated movement, but the originator of it ventured no statement as to how the opening was brought about. Shattering of vein material and subsequent cementation of the fragments into breccia within a vein is dependent upon minor movements, and it is a question if that medley of effects that the miner describes as "live" is not entirely dependent upon a breaking, often pronounced, and a later cementation.

Chicago, Ill. CHARLES A. PORTER.

Diaspore, Not Bauxite

THE EDITOR:

Sir—I have read with much interest the article entitled "Bauxite Deposits in Greece," appearing on page 693 of the Nov. 1 issue of the *Journal-Press*.

It would not be surprising to find that the Dalmatian bauxite deposits extend down into Greece, as the geological conditions hold. However, on examining the analysis given in the article, it appears that the material found is really diaspore and not bauxite, having too high an alumina content and too little water of crystallization. It is quite similar to the diaspore clays of central Missouri, as will be seen by the following analysis[1]: Alumina, 73.73 per cent; silica, 9.30; iron oxide, 0.57; soda, 2.00; potash, 0.52, and loss on ignition, 14 per cent. LLOYD T. EMORY.

Philadelphia, Pa.

Sulphur as a Fertilizer

THE EDITOR:

Sir—Iron sulphate was used in the Oregon experiments in which sulphur was applied to soils for agricultural purposes, not pyrites or sulphide of iron. Oxidation process would, of course, change the sulphide to sulphate.

The Oregon experiments show conclusively that the soils tested there needed sulphur. This is, no doubt, the reason why a response was secured through the use of iron sulphate—that is, the sulphur or sulphate radicle was the cause of the favorable effect. This is evidenced by the fact that other sulphur-carrying compounds, even sulphur alone, produced beneficial results.

In the East, where fertilizers are heavily used, the direct use of sulphur compounds or iron compounds to a lesser degree has not been given much consideration. This is due to the understanding that soils here in general contain sufficient sulphur and iron for normal crop growth, and that as for sulphur a considerable quantity is applied with commercial fertilizers.

U. S. Department of Agriculture. B. E. BROWN.

Taking the Curse Out of the Silver Dollar

THE EDITOR:

Sir—From time to time you have published items indicating the U. S. Treasury Department is attempting to encourage the use of the silver dollar. The main objection to the silver dollar seems to be the size and weight. Cannot a small amount of gold be used in the silver dollar greatly to reduce its size and weight?

Seattle, Wash. HARRY TOWNSEND.

[1]From page 19 of the Biennial Report of the State Geologist of Missouri, 1919, Missouri Bureau of Mines.

Consultation

Difference Between Virgin and Secondary Copper

"Is secondary copper adaptable to the same uses, generally speaking, that primary copper is? I have understood that it was and that consequently it would come into the market on precisely the same basis as primary copper and in direct competition with it."

Secondary copper is adapted to casting and other purposes where the highest degree of purity is not required. It ordinarily contains from 99 to 99.75 per cent of copper. Most of the virgin copper that is sold is either Lake copper which comes from Michigan and contains few impurities in the mine, or electrolytic copper, refined by electrolysis and containing ordinarily not more than one-tenth of 1 per cent of impurities. The smelters that produce the secondary copper do not have electrolytic refineries and are therefore not in position to make copper of the high purity demanded by most users. Where high purity is not an essential, however, secondary copper is just as good as virgin copper.

Capitalization of Union Miniere du Haut Katanga

"I saw the statement of the Union Minière du Haut Katanga in a recent issue of the *Journal-Press*, and have been trying to get sufficient information to find out whether the shares are a justified speculation. I want to know exactly the number of shares and the various kinds of shares outstanding, the value of outstanding bonds and other indebtedness, and various other information necessary for an investor; also, under what name and on what exchange the shares are listed."

The following information has been taken from the 1924 volume of "Skinner's *Mining Manual*" and gives the essential feature of Katanga's capitalization:

"*Capital* — Francs 176,000,000, in 300,000 6 per cent, privileged shares of 500 francs each, 260,000 capital shares of francs 100 each and 260,000 dividend shares (issued to vendors) having no face value, but having equal rights with the capital shares; 100,000 privileged shares, 260,000 capital shares and 260,000 dividend shares are issued, 150,000 dividend shares being allotted to vendors, and 100,000 capital shares subscribed at par by Taganyika Concessions, Ltd., and the Société Generale de Belgique equally in October, 1906, 25,000 capital shares offered to shareholders at 400 francs each in July, 1912, the capital being increased from 10,000,000 francs to 12,500,000 francs; and 25,000 capital shares offered to shareholders in December, 1920, at 800 francs each, the capital being increased to 15,000,000 in November, 1920, for that purpose. The capital was increased to present amount in December, 1921, by creation of a further 110,000 capital shares of 100 francs each, 110,000 dividend shares of 100 francs each and 300,000 privileged shares of 500 francs each. The dividend shares were issued to the vendors, and the capital shares at 400 francs each to shareholders (eleven for every thirty held). A first issue of 100,000 privileged shares was made at 525 francs each, shareholders having preferential right to subscribe.

"The profits are to be distributed as follows: For the years ending Dec. 31, 1927, 5 per cent, to legal reserve until the reserve reaches one-tenth of the capital, when this allocation becomes optional, 5 per cent of surplus to be divided between the directors, auditors, and a special fund for the staff, the balance to be divided equally between the capital and dividend shares. The interest on the privileged shares during the period will be charged as intercalatory interest to capital account. From January 1, 1928, the profits are to be divided as follows: 5 per cent to legal reserve (as before mentioned) interest at 6 per cent on privileged shares, 5 per cent to directors, etc., as before, 75 per cent of surplus to capital and dividend shares and 25 per cent to privileged shares, and in the event of the redemption of these shares to the participating certificates replacing them. So long as the whole of the privileged shares do not amount to 150,000,000 francs, the 25 per cent of the profits attributed to those shares will be reduced in proportion to the amount issued, and the proportion thus deduced will be added to the 75 per cent attributed to the capital and dividend shares. The privileged shares will be redeemable at par by drawings commencing Jan. 1, 1930, the shares drawn being replaced by participating certificates carrying same rights, with the exception of the right to the fixed interest at 6 per cent.

"*Debentures*—20,000,000 francs 4½ per cent, in bonds of 1,000 francs, and 40,000,000 francs 7 per cent, in bonds of 1,000 francs each. In December, 1920, holders of the 4½ per cent bonds had the right to take up the 7 per cent bonds at par. In December, 1921, a further issue of 150,000,000 francs debentures was authorized.

"*Dividends*—(Capital and dividend shares) 150 francs per share in respect of five years ended Dec. 31, 1918; for 1919, 50 francs per share; 1920. nil; 1921, nil; 1922, 35 francs per share, paid July 16, 1923.

"Voting power, one vote for each dividend or capital share and one vote for every ten privileged shares or participating certificates."

The shares of the company are listed on the Brussels exchange.

Low-grade Tin Ore

"Can you tell me who are the buyers of tin ore in the United States? I have been trying to find a market for ore that will run about 25 per cent tin, and is high in iron and silica, but so far have not been able to find anybody that is interested. To be sold in this country (Mexico), the ore must contain at least 40 per cent metal. The mine is a very small one, but I think we could make it produce one car a month, at least after we had been going a few months. We could concentrate the ore and ship it to Swansea, but that involves more expense than we want to incur until we know more about the vein. What we are looking for is someone to buy the ore as it comes from the mine, sorted of course, and give us a reasonable price for it, until we have time to do some development and find out what the deposit may be worth. If you know anybody that would be interested, please refer this letter to them, and accept our thanks for helping us out."

All of the smelters of tin ore in the United States are now closed down, with the possible exception of one or two operating on an extremely small scale. At any rate, none of them would be interested in such low-grade material. We doubt whether a market could ever be found for it, unless it had been concentrated. Under present conditions, tin concentrates can be smelted cheaper in England than in this country.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

CONSTRUCTION of several new plants in Mexico by the American Smelting & Refining Co., involving an expenditure of $10,000,000, indicates confidence in the mining industry south of the border.

Arrangements for the purchase of complex zinc-lead ore on a custom basis have been announced by the International Smelting Co. The ores will be preferentially floated at Tooele.

Activity in Tanganyika shares, in London, is ascribed to American copper interests. Tanganyika owns a large interest in Union Minière which operates the African copper mines.

It is rumored in Butte that the Anaconda Copper Co. is negotiating for the purchase of Butte and Superior's Black Rock mine.

Calumet & Hecla's long underground haulageway on the 81st level has been fully equipped and is ready for operation.

Leases totaling 3,000 acres have been taken by the Federal Mining & Smelting Co. near Pierce City, Mo. The Eagle-Picher Co. likewise has leases in the vicinity.

Preliminary sintering of roasted zinc-copper ore is expected materially to improve results in the Bully Hill smelter in Shasta County, Calif.

Two branch railways have just been placed in operation in northern Ontario. One leads to South Lorrain, the other to Kirkland Lake.

Operations at the iron mines at Bell Island, Newfoundland, have been largely curtailed owing to lack of contracts for deliveries next season.

Anaconda May Buy Black Rock from Butte & Superior

Could Operate Economically in Conjunction with Other Properties—Mill To Be Dismantled

Reports current in Butte are to the effect that the Anaconda Copper Mining Co. virtually has concluded negotiations for the purchase of the Black Rock mine of the Butte & Superior Mining Co. Auditors from the Anaconda office have been engaged on an inventory of supplies and material on hand at the Black Rock mine, which gives color to the rumors. Butte & Superior's report for the third quarter showed some improvement but for the second quarter of the current year the operating loss was $58,000.

The Black Rock is the largest single producer of zinc in the district. About one year ago the company closed its mill and made a contract for the treatment of its ore with the Anaconda company. At the time the announcement was made it was said that the treatment of the ore by the Anaconda was only to be an experiment with a view of ascertaining if a saving could be effected. It is said that it has been clearly demonstrated that the treatment costs have been considerably reduced, but in spite of this, reports given out do not show that the Butte & Superior has been making any profits of consequence. It is known that the old mill of the Butte & Superior has been permanently abandoned, and, according to reports, preparations are being made to dismantle it. The company, in addition to its zinc output, has been producing about 1,000,000 lb. of copper per month. Anaconda could doubtless operate the mine more economically than the Butte & Superior company.

Manhattan Mill at Picher, Okla., Burned to Ground on Nov. 7

The mill of the Manhattan mine of the United Zinc Smelting Co., at Picher, Okla., was destroyed by fire believed to have been due to a short-circuited electric wire, on Nov. 7. The loss is estimated at $75,000, partly covered by insurance.

The United Zinc Smelting Co. is the one in which Charles M. Schwab has a controlling interest. Besides the Manhattan, it owns the Royal and two other properties in this field. The mill of the Republic Mining Co. was repeatedly set on fire by the blaze from the Manhattan, but was saved by efforts of the Picher fire company.

Cardiff Pays Dividend

The Cardiff mine, in Big Cottonwood Canon, Utah, which on Oct. 16 paid a dividend of $50,000, will on Nov. 18 pay another of like amount, bringing the total by the company thus far to $1,025,000. Shipments are being made at the rate of 40 to 50 tons daily, and as hauling conditions improve, they will probably be increased.

C. & H. Haulageway, on 81st Level, Now Finished

Big Project Will Cut Operating Costs—Will Serve Large Territory—Electric Haulage

Calumet & Hecla's 81st level haulageway, in the Michigan copper country is completed. It connects the Calumet & Hecla conglomerate shafts at a depth of 8,100 ft. and is approximately 8,000 ft. long. After several years' work it is fully equipped and ready for use, but will not go into operation, according to the management, until all available rock is removed from the levels above the tunnel.

Eventually, all but two of the shafts, the Red Jacket at the north end and No. 12 at the southern terminal, will be abandoned and rock mined below the tunnel hoisted through the Red Jacket shaft.

Openings in the vein below the 81st, in No. 7 shaft, Hecla, which have reached the 85th level carry ore of good grade. No stoping, however, is being done, and the only rock coming from below the haulageway is that from the drifts. No. 7 will be the main operating shaft in the Hecla branch of the mine. Drifts are being extended to No. 6 on the north and No. 9-10 on the south and no further sinking is expected to be done in either of the latter. Battery locomotives are in use in all drifts and also will be employed in the haulage tunnel. The tunnel will solve the problem of deep mining and lessen costs.

Federal M. & S. Co. Leases 3,000 Acres Near Pierce City

Follows Eagle-Picher Into New Area —Shallow Deposits Contain Lead and Zinc

Renewed interest in the promising new mining field near Pierce City, Mo., several miles east of Granby, in the Joplin-Miami district, has developed with the announcement that the Federal Mining & Smelting Co. has obtained leases on approximately 3,000 acres of land in this area.

The Federal is the second important company to enter the new field, the Eagle-Picher Lead Co. some weeks ago taking leases on about 10,000 acres about six miles south of Pierce City. This company is moving the Gobbler mill, from the Wentworth district, to a mill site it has drilled out on its acreage.

Shallowness of the ore deposits is one of the most attractive features of the field. The Eagle-Picher site discloses a sheet ground formation at a depth of only 30 ft. The dirt runs rich in lead as well as zinc.

The Empire District Electric Co. is extending its power lines to the new field, and important development is believed impending.

Superior & Boston Levies Assessment for Development at Globe

T. R. Drummond, president, is preparing plans for additional shaft sinking at the mine of the Superior & Boston Mining Co. at Globe, Ariz. To defray the expense of such work, an assessment of $1 per share has been made against the outstanding stock. The present plan is to sink the McGaw shaft to the 1,800 level and develop the Old Dominion, or North vein, below its intersection with the Great Eastern. This vein was found to contain excellent silver and copper ore at higher levels. The company has on hand funds for current operations, but production from the upper levels will not support the deep development program.

Mohawk Costs Should Be Lowered in 1925

The second regrinding unit in the Mohawk stamp mill, in the Michigan copper district, will go into operation this month. The two remaining heads will be similarly equipped before spring, it is expected. The mill now is working entirely on Mohawk rock, Wolverine rock being stamped in the Wolverine mill, where one head is in operation. Better than a pound of copper per ton is recovered from Mohawk tailings in the regrinding process. High-grade rock is coming both from Nos. 4 and 6 shafts and rock of fairly good grade from No. 1. Drifting and stoping are under way in No. 1, ground being opened both north and south of the shaft. Mohawk should do better in respect to costs in 1925 than this year, due to a larger and more efficient underground organization and increased tonnage. It is expected the shafts will be full handed by the first of the year.

International Smelting Co. Will Concentrate Zinc-Lead Ores on Custom Basis at Tooele

UTAH mining companies are being offered a market for some classes of lead-zinc ores at the remodeled mill of the International Smelting Co., at Tooele. In the past it generally has been impossible to benefit from the zinc content of the lead ores, which were in most cases sent to lead smelters where the zinc was penalized if the content exceeded a certain percentage.

The International Smelting Co., which acquired the old Utah Consolidated mill, about a year ago, has remodeled a section for the purpose of treating lead-zinc ores by flotation. The lead concentrates will be sent to the lead smelter of the International near by, and the zinc concentrates to the zinc leaching plant of the Anaconda Copper Mining Co. The new section has a rated capacity of 500 tons daily, but the actual capacity is considerably greater. A second unit is under construction, so that the ultimate capacity will be 1,300 tons daily. Tests on ores will be made, free of charge, to see if they are amenable to treatment on a commercial basis. Tooele enjoys the advantages of comparatively low freight rates from tributary mining districts, so that ores of medium grade can be shipped profitably.

Sintering Machines Will Reduce Sulphur at Bully Hill

Adrian D. Joyce, Lessee, of California Zinc-Copper Property—Earlier Zinc Operations Not Profitable

Changes are being made at the Bully Hill smelter, in Shasta County, Calif., recently under the control of the Shasta Zinc & Copper Co. and now under lease to Adrian D. Joyce. Dwight-Lloyd sintering machines are being installed to decrease the amount of sulphur in the calcines from the McDougal roasters. The McDougal roasters removed the sulphur in the fine-crushed ore down to 12 per cent, and with this sulphur content the calcines were mixed with coke screenings and charged into a reverberatory furnace in which the zinc was volatilized as zinc oxide and the copper, gold, and silver collected in a matte. A further reduction in the sulphur content of the calcines was deemed necessary, and this is to be accomplished by the sintering furnaces, which will take the partly roasted ore from the McDougal roasters and reduce the sulphur content down to 2 or 3 per cent of sulphur.

It is expected that the foregoing procedure will prevent the formation of zinc sulphide in the bottom of the reverberatory and will at the same time increase the proportion of zinc recovered as oxide as well as increase the capacity of the reverberatory furnace.

By dropping the sinter instead of calcine into the furnace, less dust will be mechanically carried over with the zinc oxide. During the previous work of the plant a small amount of flue dust contaminated the zinc oxide. Crude zinc oxide will be collected in the bag-house as formerly, and this will be refined into two products, a 5 per cent-lead zinc oxide and a lead-free zinc oxide. The former will be marketed to the paint trade and the latter to the rubber trade. It is expected that the production of crude zinc oxide will be made in November and refined zinc oxide production will begin some time in December.

Cripple Creek Gold Output $585,576 in October

Exceeding in production any previous month in the year, the output of ore from the Cripple Creek district, in Colorado, for October aggregated 42,230 tons, of a gross value of $585,576.60.

Included in the above is 24,000 tons, of an average value of $21, treated at the Golden Cycle mill at Colorado Springs, and 18,230 tons, averaging $4.42, treated at the Portland mill at Victor.

The output of the Cripple Creek district up to Nov. 1 exceeds by more than $1,000,000 that of the entire year of 1923.

The new discovery made early in October on the fourth level below the Anaconda Tunnel at Cripple Creek has been opened for 30 ft., and the ore continues good in the breast as yet, giving no indication of the length of the oreshoot. Work has been delayed on account of bad air. Shipments in carlots average almost 3 oz. per ton in gold. The Tonopah Mining Co. has suspended operations at the Ajax mine at Victor.

Ohio Copper Makes Metal for 5.739c. at Bingham

The Ohio Copper Mining Co., leaching copper ore "in place" at Bingham, Utah, during the first nine months of 1924 produced from its leaching operations about 8,500,000 lb. of copper, at an average cost of 5.739c. per pound. It received 12.7112c. per pound, or $1,074,801 for 8,455,530 net pounds of copper from the smelter, after a deduction of 298,941 lb. had been made by it. The profit per pound was therefore 6.972c., and the total operating profit, $589,516. There was precipitated during the period 496,152,000 gal. of leach liquor, and the total copper content was 8,772,480 lb. The recovery was 8,482,776 lb. Measured in tons there was handled 2,078,004 tons of water, and the copper content was 4.22 lb. per ton. The average precipitation was 96.7 per cent.

New A. S. & R. Projects in Mexico Involve $10,000,000 for Construction

William Loeb, Jr., Vice-president, Tells of Work—Rosita Installation Model of Efficiency—New Concentrators at Parral and Charcas

By A. B. Parsons
Assistant Editor

A NEW ZINC SMELTER, a modern coal-mining plant, a byproduct coke plant, a copper smelter, an arsenic plant, two 400-ton concentrators, all with numerous auxiliary plants, and a model industrial town, involving in all an investment of about $10,000,000, are either just completed or in the course of construction by the American Smelting & Refining Co. in Mexico, according to William Loeb, Jr., vice-president, who returned recently from a visit to the companies' properties in our neighboring republic. These new projects are most eloquent evidence of the confidence of the officials of the A. S. & R. Co. as to the outlook for industry in general and mining in particular in Mexico. Mr. Loeb, whose impressions are gathered from observation in the small communities as well as in the cities, says that the working people seem to be better off than they have been for many years. If the present government can keep in the saddle without maintaining an expensive military establishment to quell revolutions the people need not be taxed to death. Support of the Mexican Government by the United States is the biggest single factor in discouraging rebellion, Mr. Loeb thinks.

The largest construction project is at Rosita in the Sabines coal district in the State of Coahuila. Here deposits of excellent bituminous coking coal have been developed and equipped to produce 50,000 to 60,000 tons per month. Two shafts 300 ft. deep are lined with concrete and equipped with entirely new and modern machinery. Mechanical coal cutters are operated by compressed air. Hoists and compressors are run by electric power generated at the mine from steam turbines. The boiler plant is fired with "waste" coal that is unsuitable for coking.

The coke ovens have a capacity of 15,000 tons per month, the coke being shipped to the company's lead smelters at other points in Mexico. The gas is used as fuel for the new roasting and retorting smelter at Rosita, which has a capacity of 1,500 tons of metallic zinc per month. The gas from the roasting of the sulphide concentrate is utilized to make fifteen tons of sulphuric acid per day, which in turn supplies the byproduct plant in which ammonium sulphate, benzol and tar are produced as byproducts for shipment. The entire installation is modern in every detail, a feature being the utilization of every product. Nothing is wasted. At the same time it is unnecessary to ship in any major commodity except zinc ore and concentrate. In this respect the installation is one of the most efficient in existence. Not the least important saving will be the supply of low-cost byproduct coke to the company's various lead-smelting plants in Mexico, in place of more expensive beehive-oven coke formerly used.

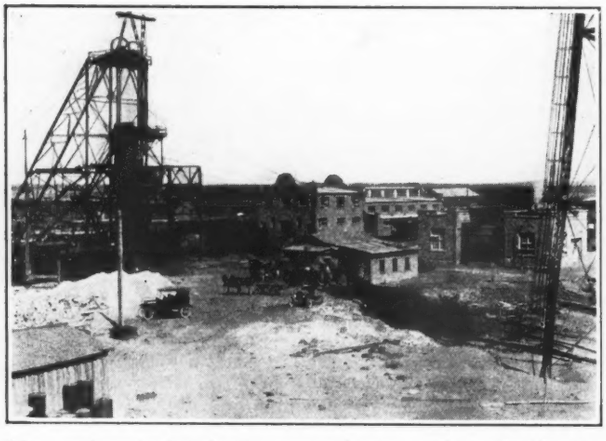
The coke ovens are now in operation and the smelting units will be started soon. The principal source of ore at the start will be the company's Tecolotes and Prieta mines at Parral. It is likely, however, that when a market for zinc concentrate is available, other lead-zinc mines can be operated that heretofore have not been able to produce profitably. Custom ores will be treated as they become available.

Mr. Loeb comments particularly on the transformation of a stretch of barren desert into an attractive town at Rosita in a single year. Provision is made for housing 5,000 Mexican people in adobe and plaster houses equipped with sewers, and supplied with excellent domestic water, piped to each house. A plaza and bandstand, public baths, a moving-picture theatre, school building for Mexican children, a Mexican club, and a market place all have been provided. This is the first time that so much money and effort has ever been expended on an industrial community in Mexico. The company hopes and expects that the conveniences and comforts will be appreciated and that more satisfied and efficient labor will be the result.

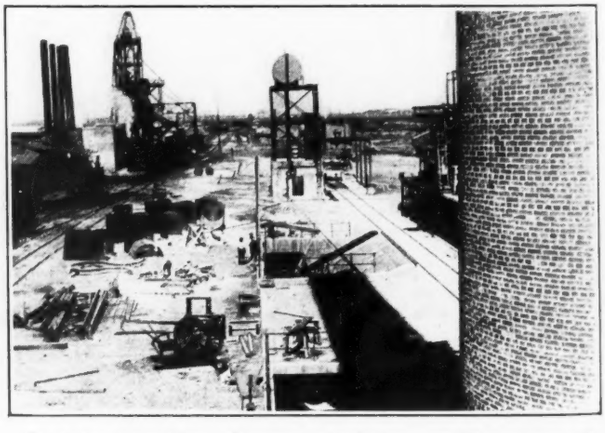
At San Luis Potosi work on a new

The hospital at Rosita

Accommodations will be provided for both American and Mexican employees in a completely equipped building



Man and material shaft, change house, and ventilating fan at the Rosita coal mine



Looking past the coke-oven stack toward the man and material shaft and boiler plant

Slow transportation, but sure
Hauling adobe brick to the Rosita townsite at 6 pesos per thousand

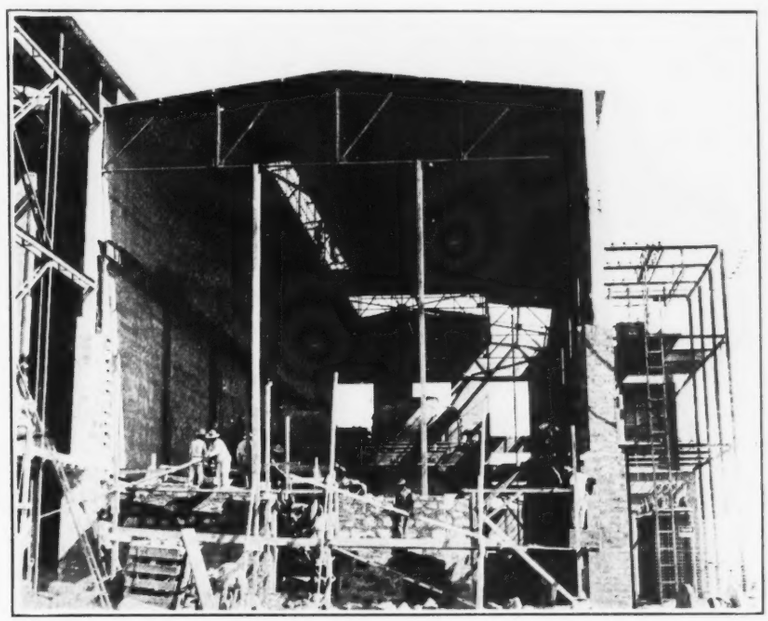
copper smelter with a capacity of 20,000 tons of charge per month is progressing rapidly. Wedge roasters, reverberatories, and converters are being installed. The plant will replace the present smelter at Aguascalientes, which is not so favorably situated with respect to rail transportation. Being old, it is not so efficient as the new plant will be.

In connection with the copper smelter is an arsenic plant which has been in operation since Sept. 1. Three Wedge roasters and refining furnaces have a capacity of 600 tons of white arsenic per month, the material treated being flue dust and byproducts from the company's other smelters.

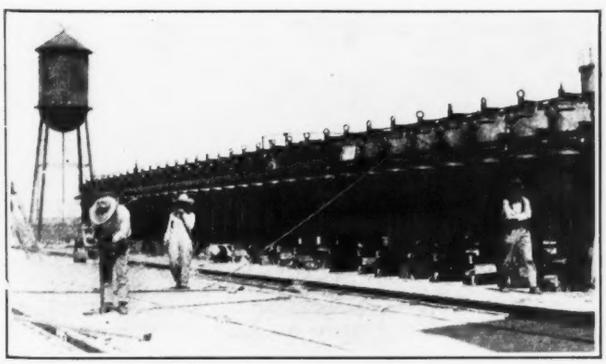
The principal source of copper ore will be the San Pedro mine, in the San Luis Potosi district. An important undertaking is the rehabilitation of the San Pedro and Somberette mines, the so-called Towne properties, and the property of the Mexican Lead Co. New equipment, both on the surface and underground, is being installed under the financing and operating agreement existing between the A. S. & R. Co. and the owners of these mines.

Each of the new concentrators is to have a capacity of 400 tons per day and will depend entirely upon flotation for the recovery of the valuable minerals. The plant at Parral, to be finished about May 1, will make a selective separation on silver-lead-zinc ore from the Tajo group of mines. A silver-lead concentrate will go to the smelter at Chihuahua and the zinc concentrate will be shipped to the new plant at Rosita. The second concentrator is being erected at Charcas and at the start will treat copper, lead and zinc ores from the Tiro General mine. The lead concentrate will go to the San Luis Potosi smelter. This plant should be finished sometime before June 1.

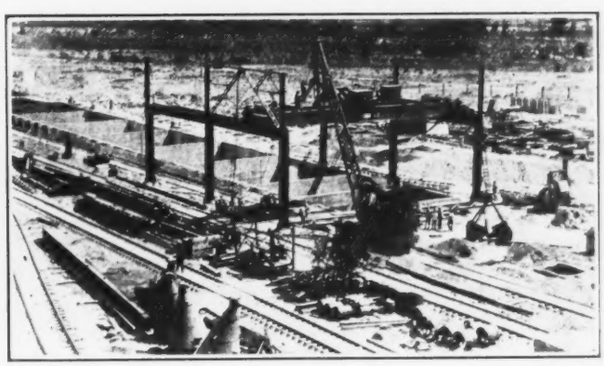
Mexico, like all other rich mining regions, is reaching the day when large-scale exploitation of medium-grade ore-bodies must displace the mining of bonanzas. Doubtless other Ahumadas and Erupcions will be opened from time to time, but costly plants for economical operation will become increasingly necessary. The A. S. & R. Co. sees the situation clearly; and, in spite of some unfavorable factors, is doing much to revive and develop the mining industry in the remarkably productive republic beyond our southern border.



The power house
"Waste" coal makes steam for these turbine-generators. Rosita and its plants are electrically operated



Working on top of the coke ovens. The gas off-takes are behind



Drainage pits and crane for reclaiming coal to feed the coke ovens

Chanute Spelter Co.'s Experience Suggests, "When at Joplin, Do As They Do in Joplin"

THE Chanute Spelter Co., a subsidiary of the American Metal Co., recently turned back to Victor Rakowsky, the leases on which the Chanute Hartley and Chanute Ebenstein mines were located. The company retains its lease on the Chanute Brewster and will likely continue active mining operations there.

While the Chanute company has produced more than 75,000 tons of ore in the Baxter Springs district, its cost of development has been so great that no great profit is understood to have been made. Mining men of this field are wondering whether the experience of the Chanute company, in fact, is not another proof of the long-prevailing opinion that the less mining operators here try Western methods of ore production, and stick to Joplin methods instead, the better off they will be.

Several smaller plants have been constructed near the Chanute mines, and almost without exception all have made good profits. Their investment at the outset has been so small that original cost has not made profits out of the question. The trouble with operations on a larger scale is that most of the ore deposits are more or less pockety, or comparatively small, and big, expensive plants are apparently a mistake. Additional proof of such a conclusion is considered offered in the fact that the Golden Rod Mining & Smelting Co., one of the larger companies of the field, has recently begun the construction of a small mill in the Baxter Springs section, apparently deliberately avoiding the heavy investment of a big plant.

Newfoundland Iron Mines Curtail Operations During Winter

Loss of German Business May Be Important—Few Contracts for Ore During 1925 Season

The British Empire Steel Corporation is curtailing operations during the winter at its iron mines at Bell Island, Newfoundland. One of the four mines lately in operation was closed down on Nov. 3 and another will shut down on Dec. 15. About 1,000 men of the 2,000 employed at the mines during the height of the season are likely to be out of work during the winter.

No contracts have so far been made for the sale of ore next year. For the last two or three years the company has made large sales of ore to Germany, but with the improvement of conditions in the international situation and the prospect of accord between France and Germany, competition with France in this market will be acutely felt, and the company is uncertain as to the outlook. Moreover the requirements of its own smelting plant at Sydney have been limited, as operations are only on a part-time basis and there is little indication of improvement in the near future.

Find Ore in United Republic Mine Near Oatman

Reports from Oatman indicate a good ore strike in the United Republic mine in the Black Range section of the Oatman district, in Arizona. The orebody was intersected by a crosscut driven from the adit at a distance of 800 ft. from the portal. It is said that good assays were obtained over a width of 20 ft. Another crosscut, 150 ft. distant from the first, is being driven to intersect the orebody. The importance of the strike cannot be estimated until further exploration work is finished. S. S. Jones is superintendent of the property.

Phelps Dodge Corporation Announces Sale of "Arizona Daily Star"

Announcement has been made by P. G. Beckett, vice-president of the Phelps Dodge Corporation, of the sale of the *Arizona Daily Star* to Ralph E. Ellinwood and William R. Mathews. The *Star* is the oldest daily in Arizona, having been started in 1877, and acquired by Phelps Dodge during 1910. The *Star* is published at Tucson. Mr. Ellinwood is the son of E. E. Ellinwood, senior member of the firm of Ellinwood & Ross, counsel for the Phelps Dodge Corporation, with offices at Bisbee, Ariz.

Utah Ore Shipments

Shipments by Tintic, Utah, mines during the week ended Oct. 31 amounted to 142 cars, compared with 138 cars the week preceding. Shippers were: Tintic Standard, 52 cars; Chief Consolidated, 47; Bingham Mines, 16; Empire Mines, 6; Mammoth, 5; Iron Blossom, 5; Dragon, 4; Centennial-Eureka, 2; Plutus, 2; Colorado, 1; Bullion Beck, 1; Mountain View, 1.

Shipments by Park City mines the week ended Oct. 31 were: Park-Utah, 2,455 tons; Silver King Coalition, 1,056; Park City Mining & Smelting and Daly, 1,050 tons; Keystone, 700; Ontario, 455 tons.

Great Western Pays Dividend

The Great Western Mining Co., operating a small high-grade gold property on Lincoln Hill, in lower Rochester, Nev., has paid its second dividend of 1c. per share, amounting to $13,300. Shortage of electric power during the last few months has interfered with production, but by the substitution of gasoline power, officials have been enabled to continue operations above the tunnel level.

Washington News

By Paul Wooton

Special Correspondent

Hoover, Hammond, Mondell, or Maybe, Work for Interior Secretary

Reorganization Within Department Might Be as Effective as New Legislation

Great interest is being manifested in the action which the President may take in connection with the Interior portfolio. This department of the Federal Government has been much in the limelight during the last two years. Its reorganization along lines which would require legislation has been urged strongly but the legislation has not been forthcoming. Some are of the opinion that the effectiveness of the department can be increased greatly without legislation through internal reorganization. In that connection the suggestion has been made that this reorganization should be entrusted to Herbert Hoover. It is argued that he has reorganized the Department of Commerce and has it running so smoothly that its direction relatively has become a matter of routine.

The real truth of the situation, despite all of the speculation which is going the rounds, probably is that the President is giving little thought to the personnel of the new Cabinet. It is recognized as one of the most disagreeable tasks which a president must perform. It is not unusual for literally hundreds of names to be suggested for positions of high honor. Only one can be chosen, which usually results in disappointment and ill feeling on the part of many of the friends of the others. The pulling and hauling over these jobs which will take place during the next three months will consume much of the President's time and destroy much of his peace of mind.

So far as the Interior Department is concerned, there is no definite information as to the desire of Dr. Work to continue and no intimation has come from the White House that a change will be made. The name of Frank W. Mondell has been mentioned for this place. He is one of the wheel-horses of the Republican Party, but the probabilities are that his conception of conservation would preclude his selection for that post. A more likely suggestion is the name of John Hays Hammond.

There is much talk of John L. Lewis as a possible selection as Secretary of Labor. Since the Secretary of Labor is the representative of all labor, union and non-union, some objection might come from workers outside the union as to the ability of Mr. Lewis to be their real friend at court.

Zinc Smelting Grows

Zinc smelting and refining in 1923 had an output valued at $94,183,900, an increase of 151.3 per cent compared with 1921. The figures are those of the U. S. Bureau of the Census. The biennial census of manufactures in 1923

Airplane Topographic Survey Made of Mount Isa Field

THE first aërial topographical survey made in Australia—that of the Mount Isa silver-lead field—has been completed, and B. Dunstan, the chief government geologist, who conducted the survey, has just returned to Brisbane. The survey is officially reported to have been quite successful, and Mr. Dunstan is favorably impressed with the efficiency of this method of carrying out this kind of work in such areas.

also showed this industry to have increased its payroll 133.2 per cent and to have employed 106 per cent more wage earners in 1923 than in 1921.

Zinc-Plant Residues May Be Re-treated at Profit

As a result of extended experiments in the retorting of zinc ores, metallurgists of the U. S. Bureau of Mines believe that they have demonstrated the feasibility of recovering a considerable amount of zinc from the residues at many of the retorting plants. These residues amount to nearly half a million tons annually. They have a zinc content varying from 5 to 15 per cent. Though it was admitted that some of the residues cannot be treated at a profit, at many plants it is regarded as entirely practicable if the proper method is selected. The Bureau, in co-operation with the zinc operators, has gathered complete information as to the various methods of treatment. It now will be a comparatively simple process, it is believed, for the operator to select the method best suited to the treatment of his accumulation of residues.

Microscopic Studies of Ore Big Help in Ore Dressing

No small amount of waste has been prevented, in the opinion of Dorsey A. Lyon, the acting director of the U. S. Bureau of Mines, as a result of the microscopic studies of ores being conducted at the Salt Lake City experiment station. By this method it is possible to predetermine the fineness of grinding and to ascertain the physical and mineralogical characteristics of complex ores that cannot be treated intelligently without that exact knowledge.

Suitability of Chloride Volatilization

In the course of its studies of chloride volatilization the U. S. Bureau of Mines has established that the ores more immediately amenable to this form of treatment are those of silver which contain more lime than will allow of chloridizing-roasting and brine leaching, and those ores of lead and zinc where it is necessary to separate the two metals. By the addition of salt complete volatilization of the lead is being obtained.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Lorrain Trout Lake Has 450 Ft. of Ore at 100 Level

Tough-Oakes Report Not Too Good—Porcupine Goldfields Development Drops Canadian Matachewan

Toronto, Nov. 9—The progress report of the directors of the Mining Corporation shows that the most important developments at the present time are on the Lorrain Trout Lake, in the South Lorrain field, in which the company has a one-third interest. Up to Oct. 15, the property has produced 316,000 oz. of silver, of which 80 per cent has come from development work; of this 180,000 oz. has come from high-grade and the rest is in the milling ore, which will be shipped over the new railroad to Cobalt at the rate of 50 tons a day.

The most important level in the mine is at 100 ft., which shows to date a length of payable ore of 450 ft., with ore in both north and south faces. The interesting feature of the 160-ft. stope which has been opened up, is that so far no blasting has been required and no dynamite has been used, owing to the fractured and oxidized character of the vein. On the 240 level 450 ft. of drifting has been done, practically all of which shows commercial ore. On the 400 level a total of 700 ft. of drifting has been accomplished, but the assays there are lower than those of the two upper levels. This level is at the contact zone, and experience throughout the district indicates that this is not the most favorable location for high-grade ore.

It is understood that a report on the Tough-Oakes-Burnside was recently made by an English engineer, and that it was somewhat disappointing. Stoping results to date have not borne out the estimate of values, as shown by the drifting. Orebodies on the Tough-Oakes are understood to be of smaller extent than the majority of mines in the Kirkland district, and it is considered to be too early as yet to make any definite statement, until development work has progressed further. The lowest level of the mine is believed to be giving the most encouraging results, but the company has decided to have an independent Canadian engineer make a thorough examination of the property, some time during the present month.

The Porcupine Goldfields Development Co. has dropped its option on the Canadian Matachewan property, because of the heavy payments with which the English company was faced; the option called for the providing of working capital to the extent of $825,000, in addition to $625,000 for 1,000,000 shares of stock, and these heavy commitments would give the English company only a little over 50 per cent. Work, however, will be continued on the Young-Davidson group, adjoining, where a large amount of diamond drilling has resulted in encouraging assays. The Porcupine Goldfields Development Co. also controls the Ankerite property, in Porcupine, on which the final payments have been made, and it is understood that a mill is to be constructed.

The Harker Gold Mines, in the Lightning River district, is being examined by an English engineer. It is understood that the company is negotiating for a large amount of working capital in England. Work is now being carried on at the 125 and 250 levels, and a total of 800 ft. of drifting has been done. There is a strongly mineralized zone on the property, with a width up to about 35 ft., in which diamond drilling has given encouraging results.

The *Mining World* of London, in discussing the affairs of the Porcupine-Davidson Co., intimates that during the interval between the reports of Messrs. Bent, Loring, and Fielding, 1919-1920, and the recent report of Messrs. Bullen and Kee, a large amount of underground work had been done, and that the mine in 1924 was in a different condition from what it was when seen by the engineers who examined it previously. It is understood here, however, that this is not the case, and that in this interval practically no work was done underground. The Bullen report will be issued to shareholders, within a few days.

Two Branch Railroads To Northern Ontario Mines

ON NOV. 9, two new branch lines of the T. & N. O. are to be opened in Northern Ontario: one into South Lorrain and the other to Kirkland Lake. These are the first branches to be built entirely for mining purposes since the Porcupine railway twelve years ago, and their construction is considered to be important, as an indication of the government's faith in these districts. They will provide an outlet for the low-grade milling ores of South Lorrain, which can be treated in the customs mills of Cobalt and it is understood that shipments will start at the rate of approximately 100 tons a day. They will also provide better and cheaper transportation of machinery and supplies, and this will result in lowering operating costs. This is particularly important for the Larder Lake district, where the indicated profit per ton is less than in some of the other camps.

El Oro Profits Off but La Noria Looks Good

The latest report of the El Oro Mining & Railway Co., Mexico, shows a slight falling off in mining profits as well as the railway operations, but the company has favorable reports from La Noria properties taken under lease in the State of Zacatecas. Engineers in charge estimate 360,000 tons of high-grade ore in sight, with a much larger tonnage of low-grade ores. A reduction plant having a capacity of 200 tons per day is now under construction with possibility of increasing the capacity to 400 tons daily. The ore carries some gold in addition to the silver content.

London Letter

By W. A. Doman

Special Correspondent

Tanganyika Shares Much in Demand by New York Interests

Activity on Exchange Follows Failure to Negotiate in Brussels—Rio Tinto Shares Buoyant

London, Oct. 28—A few weeks ago I mentioned the reported proposal of American copper interests made at Brussels, to enter into a working arrangement with the Union Minière du Haut Katanga, or, alternatively, to purchase a block of shares. Negotiations were barren. Within the past week heavy buying of Tanganyika shares (Tanganyika owns an interest in Union Minière) has been in progress, and the explanation generally given is that Americans, being unable to get into the Katanga copper business in any other way, are endeavoring to secure a foothold by purchasing shares. It is said dealings are traced both to New York and Brussels. Whether this be true or not, the market for copper shares is a rising one. As the result of Germany being put on her feet by the international loan the demand for the metal is expected to be heavy, and Union Minière and Tanganyika are not the only favorites. Rio Tinto are being bought from Paris, and South American Copper shares are also in request.

An interesting little private company—the Wiluna Development Syndicate—has been formed with a capital of £20,000 to carry on the business of prospecting and development in Australia or elsewhere. Up to date, £5,000 has been spent, largely on boring on the Gwalia Consolidated property. Three holes are being sunk, and if results should prove encouraging it is not improbable that the Lake View & Star will take a hand in the business. The Lake View acquired the Ivanhoe recently.

Engineers have been discussing a cable dispatch from the property of the Chosen Syndicate (Korea). The positive and probable ore reserves were given as 122,400 tons, valued at $10.80 per ton, and it was added that "as a precautionary measure tonnage has been increased 25 per cent, making 153,000 tons valued at $10.80." The explanation of this "precautionary measure" was that from the crosscuts it was estimated that the true width of the ore was about 25 per cent greater than that actually exposed in the main drift, and for that reason the manager had thought it prudent to increase the tonnage on No. 8 level by making such allowance for the ore not exposed in that level. It is argued that 25 per cent is a large allowance, and that though only the No. 8 level is mentioned, the total reserves are increased. A further doubtful measure is that of attributing the average value of the proved ore to what is not opened up. As the technical men say, the value may be correct, but there should be a safety factor.

The Cam & Motor (Rhodesia) report for 1923-24 is out, and makes a good showing. A higher grade of ore has been treated, and the recovery has improved from 74.6 per cent. to 78 per cent "probably due to the higher extraction by amalgamation when richer ore is milled." Working costs have fallen from 24s. 8d. per ton to 23s. 8d., of which 6d. is due to the reduction in the charge for "development redemption." Development covered 12,253 ft. and opened up 272,700 tons, or 22 tons per foot, whereas in the previous year, 8,939 ft. added an average of 30 tons. Ore of high gold content has been developed, though in depth the width of the reef is narrowing.

New Activity in Baker, Oregon, Gold Mining

Cornucopia Has Finished Raise — Bay Horse Mine Needs Concentrator —Good Ore Reserve

Baker County, Oregon, is the center of considerable activity in gold mining Several of the mines have resumed development work. Recently the Amalgamated Gold Mines Co. started its mill on Gold Creek; it expects to keep producing as long as the weather will permit. The mine has been developing for the last two years, and, according to W. Burnham, secretary, a fair tonnage of ore is blocked out. The mine is at an altitude of 6,000 ft. making winter operation difficult.

In the same vicinity the Cornucopia mine has completed a 1,600-ft. raise from the lower tunnel to the old Union mine on top the mountain. The company is producing bullion steadily from its mill.

In the Snake River district the U. S. Metals Co. has completed extensive exploration and development work on the Bay Horse mine, and hopes to begin erection of a concentrator shortly after the first of the year. According to reports of Carl Anderson, manager, a good body of ore has been developed. Money is needed to finance construction of the plant.

Engineer Gold Has Small Mill Ready To Operate

Engineer Gold Mines, Ltd., has completed a small mill, at Atlin Lake, B. C., and a hydro-electric plant on Wann River, three miles from the mine. It is expected that the mill will be put into operation during the first week in November. The company has completed its outside buildings and will have twenty men employed steadily during the winter. It is said the office building was purchased at Conrad, 70 miles from the mine, and floated on scows down Tagish Lake. It is 24 by 40 ft. and made a good load.

A high-power radio set now is being installed to keep the miners amused and in touch with the outside world during the long winter, from November to June, when the only communication is by way of Atlin, 35 miles distant. Application has been made to the Federal Government for the establishment of a post office at the mine. The Robinson Diamond Drill Contracting Co., of Vancouver, has suspended drilling operations at the mine until the spring, on account of the severe cold.

Brisbane Letter

Special Queensland Correspondence to Mining Journal-Press

Nightflower Leases Yielded 24 Per Cent Lead Ore

Silver and Gold in 850-Ton Lot—Outlook Good at Mount Isa—Plans for Sapphire Market

Brisbane, Oct. 12—The latest developments at the Nightflower lease, the principal mine on the new silver-lead field of that name in the Chillagoe district, are officially reported to be most promising. In one shaft, at a depth of 36 ft., the ore has an average width of 4 ft., averaging 19 per cent in lead, with 3 oz. of silver and 1 dwt. of gold per ton. The outcrop shaft is down 64 ft., and has an average width of ore of 9 ft.; in another, 60 ft. in depth, the average width of the lode is 3 ft., and in a fourth, which has reached a depth of 40 ft., the lode is 3 ft. and of fair-grade ore. The average value of 850 tons of ore, taken from the two deepest shafts, was 24 per cent of lead, with 29 oz. of silver and 1 dwt. of gold to the ton. On another lease—the North Extended—in a shaft sunk 22 ft.—there is about 3 ft. of lode, with an average value of 35 oz. of silver per ton and 12 per cent of lead. On this field the government holds an area of 30 acres, which adjoins the Nightflower mine.

According to a director of the Mount Isa Mines, Ltd., who has lately visited the Mount Isa field, the outlook there continues very satisfactory. This company owns most of the leases, including the principal ones, on this silver-lead field in the Cloncurry district. The big orebodies in the main leases are being systematically developed. A total of 3,900 ft. of sinking, crosscutting, and driving by the company has established the existence of five orebodies. Work to date seems to justify a big expenditure for plant and machinery, as well as for water conservation, and, it is hoped, to warrant the construction of a railway.

Under the latest plan for the marketing of sapphires from the Anakie field, which came into force in February, 1923, the gems are bought outright by the government, and 95 per cent of a grader's valuation is paid to the miners, the remaining 5 per cent being offset against the expenses. Up to June 30 last, under this scheme, 18,576 oz. of gems were received in the pool, at a value of £32,684. Of these there were sold up to that date 5,316 oz., realizing £11,319. Under the preceding scheme, the government advanced a total of £5,639 to miners on the security of their gems, and sapphires to the value of only £3,521 were sold.

The state arsenic mine at Jibbenbar, which was started primarily to supply arsenic at a cheap rate to settlers to destroy prickly pear, in the last financial year made a profit of £672, as compared with a loss of £1,252 in the year before, although the production of arsenic and the amount of the sales were less. The average cost was £43 1s. 3d. per ton, against £36 10s. 6d. in the preceding year.

Mexico City Letter

By W. L. Vail

Special Correspondent

New Branch Railroads and Automobile Highways Help Mining

Southern Pacific Will Build to Cedros Iron-ore Deposits—Automobile Road to Acapulco

Mexico City, Nov. 3—New transportation facilities will play an important part in developing the mining industry in more remote districts of Mexico. The Southern Pacific Ry. is preparing to build a branch of 100 km. from the station of Navajoa, on the Guaymas (Sonora) sector to the old town of Cedros for the purpose of tapping a large iron property near that place. The deposits, which are reported to be extensive, are the property of American interests, and it is the intention to bring them into production upon the completion of the railway.

An automobile road is under construction between Guadalajara and Zacatecas, which will serve to bring into the market ores from a number of important localities lying idle at present, for lack of adequate transportation. The automobile road though Guerrero, to the port of Acapulco, will also open up a rich section in silver and copper and possibly be the means of putting sundry iron properties on the market. This road which will be opened by the first of the year, is one of the most important undertakings of the kind in the Republic.

Reports from various parts of the country show a healthy movement in denouncement of new properties. The figures give a larger record during October than in any other month of the year, and it is expected that the closing of 1924 will show the greatest activity since the revolution put an end to prospecting and development.

Contracts have been let for a small smelting plant at Las Batuecas, near the port of Guaymas, on the Gulf of California. The plant expects to open with three furnaces by the first of the coming year, having a capacity of twenty tons daily. The ores will come from the Vedolin copper properties, 5 km. north of the station of Moreno on the Guaymas section of the Southern Pacific. This property is owned by David H. Miller.

The mining department in Mexico City is preparing to reorganize various branches. Among the changes contemplated is the organization of a special section to receive all mining payments. At present production taxes are paid at the mint, title taxes are paid at another department, and fines in still another section. The department desires to simplify the work for the benefit of the miners, at the same time increasing government efficiency.

Nine large American properties are in active operation at Parral in Chihuahua. They are: Veta Grande and Palmilla, H. H. Sharp, manager; Prieta, S. E. Reed, manager; Tecolotes, W. P. Schumacher, manager; San Francisco del Oro, E. A. Strout, manager; San Patricio, Robert McKinzie, manager; Iguana and Santa Rosalia, M. E. McDonald, manager and owner; Cigarrero, Chester Masters, manager; Guadalupe y Calvo, George Miller, manager; and Juliette, Martin Gunther, manager and owner. The Palmilla mill is working three shifts, treating ores from a number of the smaller properties adjacent.

Melbourne Letter

By Our Special Correspondent for Australia

Gold Producers Association Has Distributed $3,831,104

Marketing Cost Increases — Daisy Queen Options Vivien Gem—Will Develop Further

Melbourne, Oct. 1—The Gold Producers' Association to June 30 has distributed, in the aggregate, £3,831,104 among the members. During the last half year the net premium earned was £137,747 which represents 7s. 4.607d. per oz. standard on the gold produced. The cost of transmitting the proceeds from London to Australia has almost doubled in the last six months, to nearly 3s. 6d. per oz. fine, calculated on the present price of gold. It is felt that this is a heavy impost to be placed on the industry.

The Daisy Queen Gold Mining Co. has taken a twelve months' option on the Vivien Gem Gold mine, near Lawlers, Western Australia. The mine has been previously worked, but the shaft, which is down to a depth of 200 ft., is full of water to the 80-ft. point. The workings above this level show that the reef has been stoped for a width of about 4 ft. and a length of about 300 ft. Records show that the mine has produced 3,617 tons for 3,202 oz. from battery treatment. The company proposes to open it up with a view to further development.

The Great Northern Silver Lead Mining Co. has taken up four leases comprising 120 acres adjoining the North Broken Hill mine and intends to prospect the leases by boring. A drill is already at work on a site selected by an officer of the New South Wales Department of Mines about 20 chains north of the North Broken Hill boundary.

The Occidental Gold mine, at Cobar, has been worked for more than thirty years, with considerable success. At present it is up for sale, and a meeting of debenture holders and share holders was held a few days ago to raise the funds necessary to acquire the property from the receiver. It is estimated that there is at least 113,000 tons of ore in sight of an average assay value of 10.55 dwt. Mr. Blakemore, formerly of Great Cobar mine, expressed the opinion that the Occidental is "the best gold mine in New South Wales, if not in Australia." He said mistakes had been made in the past in the treatment of the ore, but that most of the plant on the mine could be utilized. J. Negus, former manager of Mount Boppy Gold mines, recommends the sinking of the shaft a further 100 ft. to open up the lode to a depth of 840 ft., which he anticipates would increase the reserves by 10,000 tons.

Johannesburg Letter

By John Watson

Special Correspondent

Tin Mining Industry Again Prosperous in the Union

Eight Months' Production Double That of a Year Ago—Gold Netted Only £4 10s. 5d. in September

Johannesburg, Oct. 6—The Union's total production of tin, up to date, is valued at £4,804,181. For 1923, the value of tin produced was only £173,739. Major Tudor Trevor, in his latest report, says that, with the increased price of this metal, the tin mines of the Pretoria district are again prosperous. The Zaaiplaats Tin mine, which was regarded as worked out, struck a course of fresh ore during the year and once more has prospects of a considerable life, and the Rooiberg and Leeuwpoort Tin mines are in a much more favorable position than they were at the beginning of last year. For the first eight months of 1924, local tin production was valued at £182,031, against £96,203 for the corresponding period of 1923.

The value of the mineral output of the Union for July and August, 1924, has recently been published, as follows:

	July	August
Gold (standard value)	£3,467,301	£3,431,130
Silver	15,319	25,328
Osmiridium	6,300	8,240
Diamonds	699,469	722,456
Coal (sales)	336,031	325,519
Copper ore and concentrates	66,549	46,488
Tin concentrates and metallics	15,224	18,691
Other minerals	23,840	43,276

For the first twenty-four days of September, the net price of gold, after deducting realization charges was only £4 10s. 5d. per ounce, which is not sufficient, announces the Chamber of Mines, to permit the payment for September of a bonus under the gold premium bonus scheme.

The *Government Gazette* announces that the Governor-General has refused the tender submitted by the Union Corporation three months ago for the leasing of Geduld Estates. It has been officially estimated that an expenditure of £1,800,000 would be required to develop this property, which has an area of 2,641 claims. The Government Mining Engineer recently referred to this as "the only area available for leasing which can be considered as having any chance at all of attracting the capital required to finance it."

The Minister of Mines has appointed a committee to investigate the occurrences and the control of rock-bursts in the gold mines with the measures necessary to prevent loss of life resulting therefrom. The following have been appointed to the committee: Major U. P. Swinburne, chairman, and C. J. Gray, A. C. Sutherland, H. Mitchell, M. O. Tillard, R. Orpen, C. Harris, H. Kelly, P. J. Pink, and P. Gilford, as secretary. There is still considerable stir in mining circles in the Graskop and Sabie areas, where several new companies are opening up. Glynn's Pretoria has struck reef, 31 in. thick, assaying 16 dwt., extending toward Glynn's Lydenburg.

Men You Should Know About

L. F. Strobel, engineer for Karl Eilers, has gone to Cripple Creek, Colo., for a few months.

C. N. Schuette, mining engineer, has established headquarters at 306 Call Building, San Francisco.

A. W. Stickney is on his way to examine the Benguet Consolidated mine, in the Philippine Islands.

Horace F. Strong has been appointed manager of the Lorrain Consolidated mine of South Lorraine, Ontario.

Durand A. Hall has returned to Berkeley, Calif., from examining mining claims at Tuscarora, Nev.

William Spence Black, of Boston, mining engineer, is in Clinton, N. Y., for a few weeks on professional work.

Francis N. Flynn, metallurgist and works manager of the Great Western Smelting & Refining Co., was married in Chicago on Oct. 16 to Laura Mae Gzell.

F. L. Wright, chief geologist of the Superior Oil Co., with headquarters in Los Angeles, recently made an extensive trip through the Texas and Oklahoma oil fields.

David White, of the U. S. Geological Survey, delivered an address in Bradford, Pa., on Oct. 29, in which he discussed the possibility of further recovery of oil in that region.

C. J. Pinson has resigned as superintendent of the Cia. Minera de Peñoles, S. A., to accept the position of general superintendent of the Potosi Mining Co., in Chihuahua, Mexico.

Frederick M. Ruttencutter, formerly master mechanic for the San Luis Mining Co. at Tayoltita, Durango, Mexico, is now with the Moctezuma Copper Co. at Nacozari, Sonora, Mexico.

W. H. Blackburn, who has been general superintendent and consulting engineer for the Tonopah Mining Co. of Nevada for many years, has resigned to open offices in San Francisco as consulting engineer.

David Donoghue, petroleum geologist of Houston, Tex., is in Louisiana on professional business, including an examination in the new Lake Charles oil field. Mr. Donoghue will visit the principal oil fields of the state.

Walter Douglas and **Arthur Curtis James,** directors of Phelps Dodge Corporation, will become directors of Southern Pacific R.R., and will be among the largest individual stockholders in the last-named company.

J. S. Colbath, is now assistant manager of the Benguet Consolidated Mining Co. **O. L. Kettenbach,** who has been superintendent for the last five years, will leave Manila on Nov. 15, 1924, for the United States on account of ill health.

Rupert K. Stockwell, mining engineer, left England on Nov. 8 for New York, on a trip of inspection of metallurgical plants, and expects to return to London about the middle of January. His business headquarters while in the United States will be with the Robins Conveying Belt Co., Park Row Building, New York City.

W. J. Loring, P. C. Knapp, and **O. J. Agleston** were re-elected members of the board of directors of the California Metal and Mineral Producers' Association at the annual meeting of the association on Oct. 22, 1924. **Arthur B. Foote,** of Grass Valley, was also elected a director to fill out the unexpired term of **J. A. Fulton,** who recently resigned.

Henry Gassaway Davis, 3d, who was graduated from Princeton last June, has returned to New York after spending the summer and fall at the Utica Mine of the Canadian Mines Merger, Ltd., at Kaslo, B. C. Davis is a nephew of Colonel Henry H. Armstead, president of the company, and enters the Columbia School of Mines in February for a post-graduate course in mining engineering.

William Kelly, president of the A.I.M.E., and **F. F. Sharpless,** secretary, spent Saturday, Nov. 1, in Butte, Mont., and made a tour of inspection of the various places of interest on the Butte "Hill." **Reno H. Sales,** northwest director; **S. S. Rogers, J. J. Carrigan, E. V. Daveler, A. McDonald,** and **F. M. Minister,** members of the local chapter of the Institute, had charge of the entertainment of the official guests.

Harry Townsend, mining geologist, is not, despite a recent news item to that effect, now in charge of work being done on the Nygren prospect, on the Idaho-Montana line, but is in Alaska on appointment of the U. S. Bureau of Mines examining lode prospects under the direction of D. B. Stuart. The news story was premature. Mr. Townsend will probably examine the Nygren prospect for the Standard Mines Corporation of Tacoma, next spring.

Paul A. Ehrhardt, oil producer and refiner, of Strasbourg, France, and **Andre Pellissier,** his director of mines, were in the Goose Creek, Tex., oil field recently, making a study of the rotary method of oil-well drilling. It is generally understood that cable-tool drilling is used exclusively for drilling in France, and Mr. Ehrhardt and Mr. Pellissier's investigations are being made with the view of introducing the rotary method and American machinery in that country. They will visit other fields before returning to France.

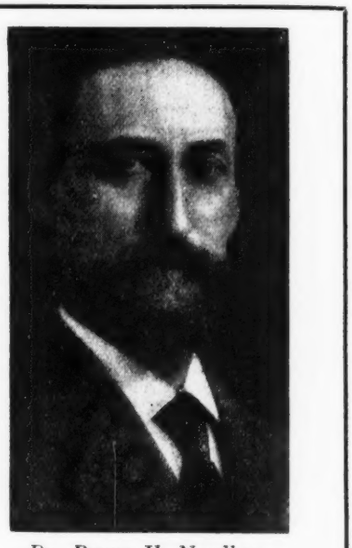
Obituary

Sir Archibald Geikie

The death of Sir Archibald Geikie, eminent British geologist, occurred at his home at Haslemere, England, on Nov. 10. Sir Archibald was eighty-nine years old. He had attained practically all of the highest honors open to men of his profession, including the presidency of the Royal Society, of the Geological Society of London, and the directorship of the Geological Survey of the United Kingdom. He was the author of numerous scientific books and papers. In 1897 he visited the United States and gave a series of lectures at Johns Hopkins University.

Dr. Bruno V. Nordberg

Dr. Bruno V. Nordberg, founder of the Nordberg Manufacturing Co., died on Thursday, Oct. 30, 1924. For more than forty years he has been closely associated with engineering progress and development in the power and mining machinery fields. He was recognized in the engineering world as one of the foremost inventive geniuses of his time. As a steam engineer he stood pre-eminent in the period in which he lived. Dr. Nordberg was born in Finland in 1857. Early in life he showed an aptitude for science and engineering and entered the University of Helsingfors, from which he was graduated in 1878. He came to this country in 1880. Soon after his arrival he found employment with the E. P. Allis Co. One of the first duties assigned him was to assist in the design of two large vertical blowing engines. One of these engines is still used for blast furnace blowing by one of the prominent steel companies. In 1886 the Bruno V. Nordberg Co. was organized to engage in the manufacture of governors. On Jan. 1, 1890, the name of the company was changed to the Nordberg Manufacturing Co. It was at this period that the first Nordberg steam engine was built, it being of the poppet valve type, and is still in service today. Among the achievements which brought Dr. Nordberg recognition among engineers in this country and Europe are included the large hoists and compressors for metal mine service, the designs for which he was largely responsible. More than a year ago Mr. Rudolph Wintzer, who for fifteen years had worked very closely as an assistant to Dr. Nordberg, was made chief engineer of the company, and a son, Bruno V. E. Nordberg, was appointed executive engineer and assistant to Mr. Wintzer. Dr. Nordberg was a member of many engineering and scientific societies and was honored by mechanical experts both in this country and Europe. The degree of Doctor of Engineering was conferred upon him by the University of Michigan in 1923 in recognition of his skill in the design of special machinery.



Dr. Bruno V. Nordberg

Recent Technical Publications

Reviews, Abstracts, and References

The Nov. 1 issue of *Rock Products* carries an announcement of the merger of that publication with *Cement and Engineering News*. Both are well-established Chicago periodicals, *Rock Products* having been founded in 1902 and *Cement* in 1896. Cement is, of course, one of the principal rock products, and the subscribers to each of the merged magazines have many common interests. We wish the new magazine prosperity, and hope that we may find it as attractive and interesting a publication as *Rock Products* has been, with its profuse illustrations. We have not been familiar with its mate, the cement industry being entirely without the field of *Mining Journal-Press*.

In an adequate and favorable review of the 1923 volume of "The Mineral Industry" in the London *Mining Journal* of Oct. 25, the reviewer says: "Mr. Robert J. Anderson gives us an important article on aluminium and bauxite, in connexion with which it is perhaps permissible to express satisfaction that the European practice of spelling the name of the metal has been adopted." "Retained" would have been a better word, for "Mineral Industry" has followed the British spelling for years and years. We have never understood why "aluminum" was not just as good, and in fact a little better because simpler, than "aluminium," which it antedates in use. If "aluminium," then why not "platinium" and "molybdenium" too? In this connection, we have noticed an increasing tendency among American book publishers of the higher class to use the British spelling in words like "humour" and "labour," though they do not see fit to adopt the short British spelling of "connexion." But we can still always spot the British writer within three paragraphs, when we are sure to find a "whilst."

The Ironmonger, of London, takes exception to "an acidly contemptuous criticism" of the methods of the iron and steel masters of England, from the pen of "a Mr. Herbert N. Casson," in the *New York Evening Post*. Among Mr. Casson's remarks he says: "Britain has a sad collection of beaten industries, and of all these, the iron and steel industry is the most hopeless. It has been beaten for forty years, and it has shown no signs of recovery." *The Ironmonger* caustically remarks, "It was possibly by oversight that Mr. Casson neglected to include among the troubles of the British steel makers that of ill-informed criticism," and goes on to show how ridiculous some of the charges are. It shows, for example, that British exports of iron and steel have been running about twice those of the United States in the last few years. Evidently Mr. Casson's article was one that the Hearst press would have been eager to get. We did not see the article in question; we used to buy the *Post* occasionally, but that was before the Curtis Publishing Co. bought it and began trying to make it a bigger and better paper and a more worthy exponent of American business.

We are just in receipt of the second edition of a voluminous French work on non-ferrous metallurgy — "Metallurgie des Metaux Autres que le Fer"— by Eug. Prost. (Librairie Polytechnique Ch. Beranger, 15, Rue des Saints-Pères, Paris.) It contains separate chapters on zinc, cadmium, lead, silver, gold, copper, nickel, cobalt, tin, quicksilver, antimony, bismuth, aluminum, magnesium, platinum, manganese, chrome, tungsten, molybdenum, vanadium, and titanium. No English book covers this field, and it looks as though we must brush up in our French to get the benefit of it. As a terrible confession of ignorance we must admit that we did not know of the first edition of this book, published twelve years ago, when we were not so interested in those things.

And a letter to the "Literary Editor" [bow] from Henry Carey Baird & Co. announces a new book, to be published next month, by the Robert J. Anderson mentioned above, on aluminum, covering everything from the mining of bauxite to the use and application of aluminum and its alloys. The metallurgy of aluminum is something about which most metallurgists are able to find out little, the processes of the Aluminum Company of America being deep dark secrets—even more so than those of the New Jersey Zinc Co. A book on aluminum would seem to be a sacrilege.

The new "Mines Handbook," by W. H. Weed, is again promised in one month. This confirms a similar announcement we made on Oct. 18.

The Mineral Industry, 1923. Edited by G. A. Roush. McGraw-Hill Book Co., New York City. Price $12.

We have tried for the last five years to say something new and interesting about the new annual volumes of "Mineral Industry," but have been unsuccessful, as we shall be now. Most of our readers are familiar with it as the best statistical, technologic, and economic review of the metal and mineral industries. The chapters, each written by an expert, cover practically all the commercial metals and minerals, and a final and most interesting one of 55 pages is devoted to progress in ore dressing and coal washing. Much of the matter is abstracted from periodicals, but some of the authors have taken great pains to include a large amount of original matter. The bibliographies at the ends of each chapter and in the footnotes are often particularly valuable for reference.

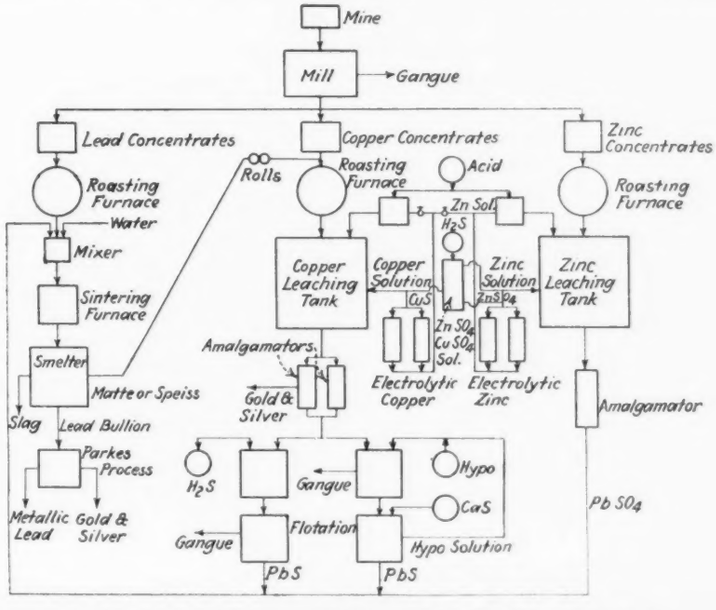
Probably half the questions which come into the *Mining Journal-Press* office from readers could be answered by reference to the last "Mineral Industry." We do not mind answering the questions, but often the inquirer is in a hurry to get his information.

E. H. R.

Patents

Sulphur Recovery from Gas — No. 1,510,342. N. E. Rambush, Stockton-on-Tees, England. Sulphur is removed from gases by circulating in suspension a solid oxidizing agent through the gases.

Complex-ore Process—No. 1,509,947. W. E. Greenawalt, Denver. Ores containing copper and zinc are concentrated by a selective process making one product low in copper and high in zinc and the other high in copper and low in zinc. These are separately roasted. An acid solution is applied to the copper concentrate, extracting both the copper and the zinc, and the copper then precipitated from the leach solution. When the zinc builds up to a sufficient degree, the solution is applied to the roasted zinc concentrate.



Flow sheet of Greenawalt process, Patent No. 1,509,947

New Machinery and Inventions

Another Portable Air Compressor

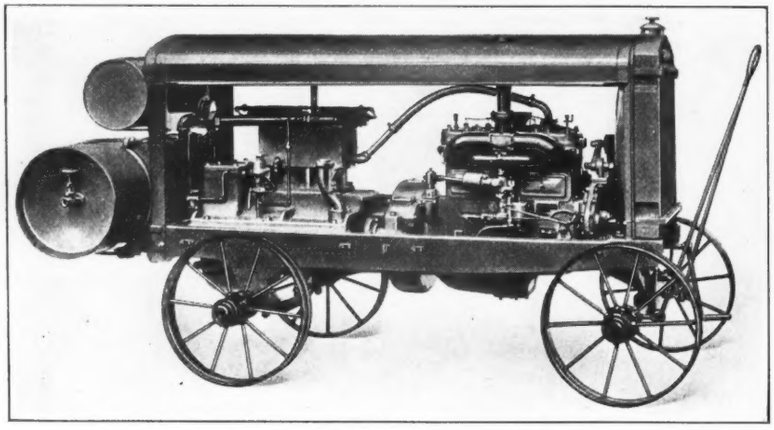
New Machine Intended for Use in Many Branches of Industry As Well as Mining

A portable air compressor recently placed on the market by the Sullivan Machinery Co., 122 South Michigan Ave., Chicago, Ill., has an unusually wide range of service. It has a capacity of 103 cu.ft. of free air per minute, against 100 lb. pressure, requiring 17 hp. for this duty. It is direct-connected to a Buda four-cylinder, four-cycle gasoline engine. The compressor is of the vertical, two-cylinder, single-acting single-stage type. It is claimed that it will operate one Rotator hammer drill at full speed and capacity, or two or more smaller pneumatic tools, as is desired.

The drive between the engine and compressor is by means of a positive clutch, consisting of an internal and external geared connection. Lubrication is automatic, and cooling water for the engine and compressor is supplied by a circulating pump in the same system. The air valves are of the Sullivan "wafer" type, strong and simple in design, quiet in action, and giving small clearance losses.

The compressor, engine, and equipment are mounted on a one-piece steel casting of rigid construction. The 12-gal. gasoline tank and the 18x48-in. air receiver are carried horizontally in cradles at the rear of the truck body, and all working parts of the compressor are protected, when not in use, by sheet-steel sides, which are locked in place against the base and the steel canopy top, thus protecting the outfit from the weather and from theft of equipment.

This machine is ordinarily mounted on a steel wheel truck for highway use, weighing 3,235 lb. in this form. It may, however, be mounted on a trailer truck with rubber tires for use on city streets, or on a wooden skid if maximum portability is not necessary. It may also be set on a Ford truck. The photograph below shows the standard mounting.



Another portable air compressor

This has a capacity of 103 cu.ft. of free air per minute against 100 lb. pressure, and requires 17 hp. for operation. It also comes mounted on a trailer truck, on a Ford truck, or on a wooden skid, as desired.

A Twenty-one-Ton Hydraulic Press for Test Work

Various Types of Containers Allow Even Liquids To Be Compressed

Capable of handling a wide range of materials, a twenty-one-ton hydraulic press made by the Hydraulic Press Manufacturing Co., of Mount Gilead, Ohio, is useful for testing work in mining laboratories. The base of the press is of solid steel, into which are screwed two forged-steel strain rods. A cast-iron yoke through which runs a long screw supports these rods at the top. The screw is operated by a hand wheel.

The platen slides on brass-bushed bearings on the strain rods, and a rim around its edge catches any liquid that may flow over the sides, for draining which a spout is provided. The platen is cast with a 3½-in. ram extending into the steel base which serves as a hydraulic cylinder. The ram is forced forward by means of a screw and hand-operating device.

In operating, the material to be pressed is placed on the platen and the swivelled head on the screw is screwed down tight against it. The other screw is then made to bring pressure on the liquid filling the cylinders, and the main ram is forced upward to compress the material. When the gage indicates a pressure of 4,200 lb. a square inch, a total force of twenty-one tons is exerted between the swivel head on the screw and the platen.

To test various classes of materials, several types of containers have been adapted. Two sizes of curb-type containers are used, each having steel plates drilled and grooved to facilitate drainage, and these plates are used in pairs with the grooved faces together. The ring container is another type. This consists of a series of ten rings bolted together and grooved and drilled so that the plunger fits in the center of the rings on top of the material and the pressure is applied to the plunger.

This twenty-one-ton hydraulic press is intended for laboratory experimental work

The gage shows the pressure exerted between the swivel head on the screw and the platen. Above are shown curbs, plates, and attachments for the press.

Still another type is the filter pot containers used with substances in a liquid or semi-liquid state.

An almost unlimited range of experimental work can be handled in the press, including extraction, filtering, briqueting, extruding, and small forming and forcing jobs. For briqueting, the dies may be arranged to press from one or both sides, and dies for extruding metal and other substances may be used in the press. For oil extraction, the containers are made very thick, so that when heated they will retain the heat during the period of pressure.

Insulation Guides for Mining Locomotives

The Westinghouse Electric & Manufacturing Co. is distributing "insulation guides" for 250 to 500-volt d.-c. mining locomotives. These guides are designed to be hung upon the walls of repair shops where they may be readily referred to when equipment is being repaired. The different grades and kinds of materials used for insulating the various kinds and parts of locomotives are tabulated in convenient form for reference. The charts show the practice of the Westinghouse company.

The data card is known as H. C. 235, and may be had upon request.

Newly Designed Electric Pyrometers

A complete line of indicating and recording pyrometers, together with the usual thermocouple accessories, was recently exhibited for the first time by the Republic Flow Meters Co., of Chicago, Ill., at the American International Steel Exposition, held in Boston, Mass. In these instruments, which have just been designed, are incorporated features that have been requested by users of pyrometers, according to the company.

The clock has a complete time element with the usual escapement and with its own main spring, and performs no other function than to release the operating energy periodically through the second or power escapement. No power passes through the timing escapement, and as a consequence the timing is not influenced by the quantity of reserve power that remains in the springs. This clock is, incidentally, an excellent time keeper.

In the recording pyrometer two independent charts are used. By using two separate sheets of paper, it is possible to have any combination of scale ranges desired. Six-inch charts are used on the duplex recording pyrometer. The actual scale range is 5¼ in.

A tear groove directly at the driving drum permits extraction of the record instantly without waste of chart. A clutch on each driving drum enables one to operate either or both charts at will. The charts last 1,200 hours.

A carbon ribbon is automatically advanced across the face of the chart, and the instrument pointer moves freely between a depressor bar and the back of this ribbon. The pointer deflects in proportion to the temperature at the hot junction of the thermocouple and there is no frictional resistance at the pointer. Just before the depressor bars come down, the carbon ribbon comes forward, covering the knife edge which runs the width of the charts and is located directly beneath the depressors.

When the carbon has advanced to cover the knife edge, the depressors drop, and a dot is made on the face of the chart. The depressors then rise, the carbon drops back, and the dot that has just been made is visible. Visibility is required, and it is not satisfactory to permit the carbon marking band to remain over the chart. In some instruments visibility is secured by having the carbon marking band on the under side of the chart, but this is not as satisfactory. All the charts used in these pyrometers have 20 deg. F. to each division. This is possible even with the 3,000 deg. F. charts.

All mechanism in the recording pyrometer is mounted on a swinging bracket. Every detail of the complete assembly is visible and accessible. The bracket on which all mechanism is mounted also forms a cover for the electric system which is attached to the back of the bracket. Two screws hold the bracket closed and the electric system is thereby thoroughly protected.

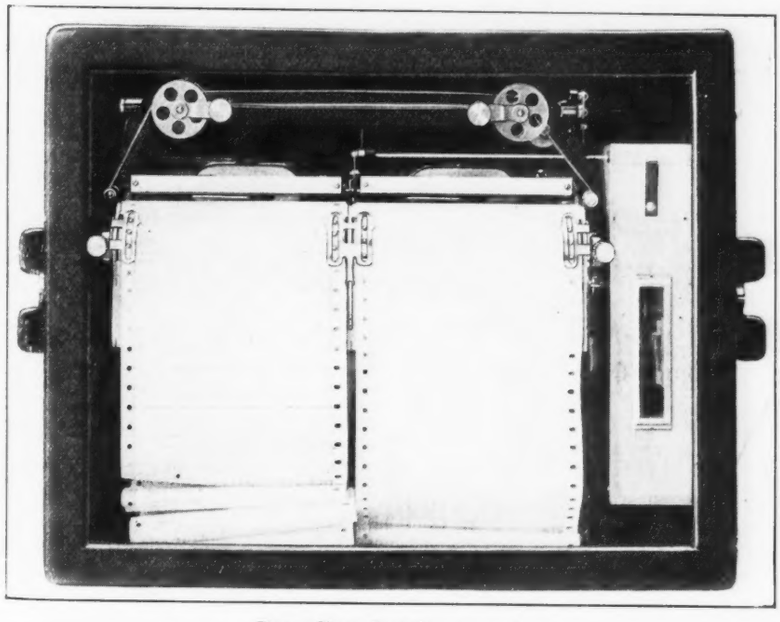
Fifty ohms' resistance is taken from the fixed resistor and placed in a variable rheostat having a scale of 25-0-25 ohms. These instruments are accurately calibrated for the external circuits stipulated, but if at any future time it is necessary to change the length of the extension leads, instantaneous and accurate adjustment can be made within the instrument.

A small toggle switch, which is plainly marked "on and off," is built into the instrument, which, when closed, short-circuits the magnetic field and damps the movement of the pointer when in transit.

The instruments run very high in resistance. High resistance assures accurate reading.

Wall-type indicating electric pyrometer with moisture-proof twelve-point rotary, selective double-pole switch

A long scale is provided, affording open graduations. Die castings and Bakelite moldings are used to a large extent in making the instrument.



Recording electric pyrometer

Two independent charts are incorporated in the device, making it possible to have any combination of scale ranges desired

A Power-saving Device

A device known as a "maximum demand regulator" for reducing peaks and power demands on electric systems, has been developed and placed on the market by Edward T. Moore, electrical engineer drawer No. 4, Syracuse, N. Y. The device can be used to limit the amount of power taken by any current-consuming device and is especially adapted for use with large loads, such as electric steel melting furnaces, annealing and heat-treating furnaces, and pulp wood grinders, as well as for motors and other equipment.

The equipment is mounted in two pressed-steel cabinets, each 14x11x4 in., is very simple to install, and requires practically no attention, yet is said to be absolutely reliable. Savings in installations to date are reported to be considerable. The regulator may be set to limit any power load to a predetermined amount and may be used for any length of demand period, such as one minute, five, ten, fifteen, thirty minutes, or one hour and may be changed as desired. The method of measurement of the demand, either by a graphic meter or integrated meter, can according to the manufacturer, be successfully accomplished.

"Apex" CO_2 Recorder

Realizing that most of the smaller plants and even some of the larger ones consider the prevailing cost of CO_2 recorders too high to warrant investing in them, the Uehling Instrument Co., of Paterson, N. J., is introducing an entirely new recorder known as the "Apex." The price is less than half that of other CO_2 machines. The "Apex" CO_2 recorder employs no chemical solutions and there are no movable parts excepting the pen mechanism. This instrument will be exhibited for the first time, at the Power Show at the Grand Central Palace in New York in the first week in December.

The Market Report

Daily Prices of Metals

Nov.	Copper, N. Y. net refinery	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
6	13.475@13.50	52.875	53.375	8.70	8.40@8.75	6.60
7	13.50	53.25	53.75	8.70	8.40@8.75	6.625@6.65
8	13.50	53.75	54.25	8.70	8.40@8.75	6.65@6.675
10	13.625	53.875	54.375	8.65	8.40@8.80	6.70@6.725
11	13.625	53.875	54.375	8.65	8.40@8.75	6.75@6.775
12	13.625@13.70	53.875	54.375	8.65	8.40@8.75	6.80
Av.	13.567	53.583	54.083	8.675	8.579	6.696

*These prices correspond to the following quotations for copper delivered: Nov. 6th, 13.725@13.75c.; 7th and 8th, 13.75c.; 10th and 11th, 13.875c.; 12th, 13.875@13.95c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Engineering and Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Nov.	Copper			Tin		Lead		Zinc	
	Standard		Electrolytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
6	63 5/8	64 3/4	67 3/4	256 3/4	259 3/4	39	36 7/8	34 1/2	34 1/4
7	63 3/8	64 1/2	67 3/4	257 3/4	260 1/4	38 5/8	36 5/8	34 5/8	34 5/16
10	63 1/2	64 5/8	68	258 1/4	261 1/4	39 1/16	36 7/8	34 3/4	34 7/16
11	63 3/4	64 3/4	68	258 3/4	261 3/4	39 5/16	37 1/16	34 15/16	34 9/16
12	64	65 1/8	68 1/4	259 1/8	262 3/8	39 1/2	37 1/8	35 1/8	34 11/16

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Nov.	Sterling Exchange "Checks"	Silver		Gold London	Nov.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
6	4.56	69 1/2	34 5/16	90s 9d	10	4.61 1/2	69 1/4	33 13/16	90s 2d
7	4.56 1/2	69 1/2	34 1/4	90s 10d	11	4.61 1/2	69 1/2	33 13/16	89s 8d
8	4.60	69 1/2	33 15/16	...	12	4.59 1/2	69 3/8	34	90s 2d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Copper, Zinc and Tin Firm at Higher Prices

New York, Nov. 12, 1924—The non-ferrous metal markets are showing greater signs of life than they have for many months. Copper and zinc prices advanced again during the week on the strength of substantial buying by consumers. Lead is pausing but in an exceedingly strong position. Doubtless the better post-election business sentiment has had much to do with the improvement of the markets. Producers are more cheerful about the outlook for the non-ferrous metals than they have been at any time since the beginning of this year.

Copper Touches 14c.

Copper has moved slowly and steadily to a higher price level. A good volume of metal is moving into domestic consumption and this, together with export sales, has caused a few producers to decrease the size of their offerings to consumers. Producers generally were selling freely at 13¾c. delivered on Saturday, with a slight shading of quotations here and there, but beginning with Monday the market became firmer, copper companies having no difficulty in obtaining 13¾c. for their product. Although most of the sales made were for delivery throughout the balance of the year a few were concluded for shipment in January, for which 14c. was secured today. The forward market is above the prompt quotation, which today is above 13⅞c. but below 14c.

Brass companies in the Connecticut Valley are reported to be doing business at a good rate. Advanced prices for their manufactures have not lowered the orders received. Sheet copper manufacturing is also in good shape but the feeling is prevalent among manufacturers that the spread between the finished product and the price of the raw material should be changed. The sales of wire mills have been good for October but only fair so far in November. No boom is noticeable in these industries since the election but a steady betterment in their position.

Export business of the copper producers has been fair with some maintaining that the domestic market has been more attractive to them than Europe.

Lead Prices Holding Firm

The official contract price for lead, of the American Smelting & Refining Co., continues at 8.65c. per lb., New York.

Little change in the lead market has occurred. If anything, the market is quieter since Monday although sales have been made every day. It would appear that consumers purchased somewhat more than their requirements of lead on the present upward movement and are now content to await developments for a time. The St. Louis market has been more active than New York with common lead bringing all the way from 8.40 to 8.80c. per lb. in the West. In Chicago, 8.90c. was obtained for some metal. Last Thursday and Friday a fair quantity of lead brought 9c., New York, but the largest quantities moving into consumption were sold for 8.65c.

The foreign market continues to be strong with prices rising daily. At present the spread between the spot and 3 months' quotation in London shows a backwardation or discount in favor of spot of £2 7s. 6d. The world is practically bare of lead stocks, especially abroad. All Mexican lead is being shipped to Europe as it is the most desirable market for shipments today. Antimonial lead has been sold in the domestic market for prices about ⅛c. below those of common lead.

Zinc Sales Unusually Heavy

Sales of both Prime Western and Brass Special grades of slab zinc were very large during the week, not alone in the domestic but also in the export market. Last Thursday, Prime Western was sold for 6.60c. per lb., E. St. Louis, and today for 6.80c. The gain in price was regular every day. Consumers commonly requested shipment during November and December with some interest shown in January delivery.

There is little, if any, difference between the prompt and forward quotation. A feature of the sales made was a contract which was negotiated with a galvanizer for the delivery of a large amount of Prime Western over the entire twelve months of 1925 at a fixed price—about one-quarter cent above the quotation of the day on which the sale was made.

The statistics of the American Zinc Institute for October, in tons, are as follows:

Stock, Oct. 1	45,720
Produced	42,488
Shipped	49,756
Stock, Oct. 31	38,452
Shipped from plant for export	8,299

The figures show a sharp drop in stocks and a movement outward amounting to over 18 per cent of domestic production.

Moderate Interest in Tin

Consumers have been discriminating buyers of tin during the week and have purchased fair tonnages. Little inclination is shown to buy futures. The spot market for Straits is now 54.375c.

Arrivals of tin at Atlantic ports totaled 3,935 long tons through Nov. 11; at Pacific ports they amounted to 55 long tons.

Foreign Exchange Irregular

On Tuesday, Nov. 11, closing cable quotations on francs were 5.33c.; lire, 4.33; marks (new), 23.81c. Canadian funds in New York at par.

Silver Holds Steady

Silver in New York holds steady, with fluctuations in the Sterling Exchange rate practically offset by the London price. There are no present indications for a change of any importance.

Mexican Dollars—Nov. 6th, 53⅝; 7th, 53⅝; 8th, 53⅝; 10th, 53⅜; 11th, 53⅜; 12th, 53¾.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £125 per long ton.

Antimony—Per lb.:
Chinese and Japanese brands, 15c.
Cookson's "C" grade, 15¼@15⅜c.
Chinese needle, lump, nominal, 10c.
Standard powdered needle, 200 mesh, 11½c.
White oxide, Chinese, 99 per cent Sb_2O_3, 13@14c.

Bismuth—$1.85@$1.90 per lb. London, 7s. 6d.

Cadmium—60c. per lb. London, 2s. 2d.@2s. 6d.

Iridium—$260@$270 per oz.
Iridium alloyed with platinum, $280@$286.

Nickel—29@30c. per lb. for 99 per cent virgin metal. Electrolytic, 33c.; London, £160 per long ton.

Palladium—$83 per oz. Crude, $60@$65.

Platinum:
Refined, $118 per oz.
Crude, $111@$112.

Quicksilver—$68@$69 per 75-lb. flask. San Francisco wires $71.50; London, £10⅜.

The prices of **Cobalt, Germanium Oxide, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten,** and **Zirconium** are unchanged from the prices given in the Nov. 8 issue.

Metallic Ores

Chrome — $18.50@$24, depending upon grade and source. Nominal.

Manganese—39@41c. per long ton unit, seaport, c.i.f., for Caucasian and Brazilian ore, plus duty. Consumers well provided.

Molybdenum — 70@75c. per lb. of MoS_2 for 85 per cent concentrates. Nominal.

Tungsten Ore—Per unit, N. Y.:
Chinese wolframite, $8.50@$8.75.
Western scheelite, $8.75@$9. Inquiry better.

Iron Ore, Galena and **Pyrite Radio Crystals, Tantalum,** and **Vanadium Ores** are unchanged from Nov. 8 quotations.

Zinc Ore Higher—Lead Firm

Joplin, Mo., Nov. 8, 1924

Zinc Blende	Per Ton
High	$46.65
Premium, basis 60 per cent zinc	$46.00@ 47.00
Prime Western, 60 per cent zinc	45.00@ 45.50
Fines and slimes	44.00@ 42.00
Average settling price, all	44.84
Lead	
High	$121.25
Basis 80 per cent lead	120.00
Average settling price, all	113.53

Shipment for the week: Blende, 14,741; lead, 2,764 tons. Value all ores the week, $975,870.

A refusal to accept an offer of $46 basis was made, the owner asking $46.50 basis on account of excess iron contents, on which there is a heavy penalty.

The lead market was firm, with some sellers reported declining to accept the $120 basis offering.

There was purchased this week 14,880 tons, more than was either produced or shipped.

Platteville, Wis., Nov. 1, 1924

Zinc	Per Ton
Blende, basis 60 per cent zinc	$47
Lead	
Lead, basis 80 per cent lead	$120

Shipments for the week: Blende, 335 tons; lead, 215 tons. Shipments for the year: Blende, 24,850; lead, 1,095 tons. Shipments for the week to separating plants, 1,062 tons blende.

Nov. 8, 1924

Zinc	Per Ton
Blende, basis 60 per cent zinc	$47
Lead	
Lead, basis 80 per cent lead	$120

Shipments for the week: Blende, 695 tons; lead, none. Shipments for the year: Blende, 25,545; lead, 1,095 tons. Shipments for the week to separating plants, 1,062 tons blende.

Non-Metallic Minerals

Amblygonite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Corundum, Diatomaceous Earth, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Mica, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli and **Zircon** are unchanged from Nov. 8 prices.

Mineral Products

Arsenious Oxide (white arsenic)—6½@6¾c. per lb. Some foreign competition.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from Nov. 8 prices.

Ferro-Alloys

Ferromanganese—Domestic, German, and English, $100 per gross ton.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrotungsten, Ferro-uranium and **Ferrovanadium** are unchanged from the prices given in the Nov. 8 issue.

Metal Products

Rolled Copper — Sheets, 21½c. base; wire, 16½c.

Lead Sheets—Full, 12c.; cut, 12½c.

Nickel Silver—Grade A sheets, 18 per cent nickel, 27½c. per lb.

Yellow (Muntz) Metal—Sheets, 18⅞c. per lb.; rods, 15⅞c.

Zinc Sheets—10.25c. per lb.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick, and **Zirkite** are unchanged from Nov. 8 prices.

Iron Trade Optimistic

Pittsburgh, Nov. 11, 1924

Sentiment in the steel trade among both buyers and sellers is much improved since the election, and in some lines there is already a noticeable increase in buying. October ingot production was 66.4 per cent of estimated capacity, and November mill operations are likely to show a slight gain.

The tone of the steel market is improved and prices of some lines may advance. Since April of last year the only price changes have been downward, so that the market may be ripe for a turn. Sheets and plates have been going at unprofitable prices. There are signs that shading in plates is decreasing. The recent shading in galvanized sheets has greatly decreased.

Pig Iron—Following the 50c. decline in basic iron reported last week, bessemer and foundry are off a like amount, the market being now $19.50 on bessemer, $18.50 on basic, and $19 on foundry, f.o.b. Valley furnaces. The market is dull.

Connellsville Coke — Market quiet. Spot deliveries not overly firm. Operators intend to seek an advance on first-quarter contracts when inquiry develops. Spot: Furnace, $3@$3.10; foundry, $4@$4.50; heating and smelter, $2.75@$2.90.

Freight Rates on Metals, Ores, and Concentrates

Carload Lots

Copper Bullion and Refined Copper

From	To	Rate per Ton of 2,000 Lb. All Rail	Via Gulf
El Paso, Tex.	Baltimore, Md.	$11.40	$10.00
Garfield, Utah	Perth Amboy	12.50	.....
Garfield, Utah	San Francisco	5.85	.....
Hayden, Ariz.	Perth Amboy	14.50	12.50
Miami, Ariz.	Perth Amboy	14.50	12.50
Anaconda, Mont.	Perth Amboy	12.50	.....
Butte, Mont.	Perth Amboy	12.50	.....
Humboldt, Ariz.	Chrome, N. J.	14.50	12.50
Douglas, Ariz.	Perth Amboy	14.50	12.50
Globe, Ariz.	Perth Amboy	14.50	12.50
Clifton, Ariz.	Perth Amboy	14.50	12.50
Clarkdale, Ariz.	Chrome, N. J.	14.50	12.50
Copperhill, Tenn.	Laurel Hill, N. Y.	$10.80	.....
Tooele, Utah	Chrome, N. J.	12.50	.....
McGill, Nev.	Baltimore, Md.	15.90	.....
Houghton, Mich.	New York	(a) 9.60	.....
Hancock, Mich.	New York	(a) 9.60	.....
Hubbell, Mich.	New York	(a) 9.60	.....
Dollar Bay, Mich.	New York	(a) 9.60	.....
Tacoma, Wash.	New York via Canal	Conference rate	$6.00
Anaconda, Mont.	Tacoma, Wash.	7.09	.....
Ajo, Ariz.	New York	14.50	$12.50

(a) Applies April 1 to Nov. 30.

Marine Freight Rates

New York to
- Hamburg — *$5.00 per gross ton copper and lead
- Liverpool — *5.59 per gross ton copper and lead
- Antwerp — *4.50 per gross ton copper and lead
- Havre — *4.75 per gross ton lead; *5.00 per gross ton copper

Gulf ports to
- Hamburg — *$5.00 per gross ton copper and lead
- Liverpool — *5.50 per gross ton copper and lead
- Antwerp — *5.00 per gross ton copp and leader
- Havre — *5.00 per gross ton copper

Pacific coast ports to
- Hongkong — $6.00 per short ton
- Kobe — 6.00 per short ton

Lead Bullion (Pig Lead Where Shown)

From	Rates per Ton of 2,000 Lb. To New York	To St. Louis
East St. Louis, Ill.	$7.00	.....
Pueblo, Colo.	*12.50	$9.00
Leadville, Colo.	12.50	*9.00
East Helena, Mont	12.50	9.50
El Paso, Tex.	10.00 Via Gulf	
	12.00 All Rail	7.00
Omaha, Neb.	9.60	3.65
Murray, Utah	12.50	*9.00
Midvale, Utah	12.50	*9.00
Tooele, Utah	12.50	*9.00
East Chicago, Ill.	6.40	(a) 2.00
Kellogg, Idaho	13.50	9.50
Carnegie, Pa.	3.80	(a) 5.00
Selby, Calif.	(b) 6.00	.....
Herculaneum, Mo.	(a) 8.80	(a) 1.80
Federal, Ill.	7.00	(a) 1.80
Collinsville, Ill.	7.00	(a) .75½
Granby, Mo.	(a) 10.50	(a) 3.50
Joplin, Mo.	(a) 10.50	(a) 3.50

(a) Pig lead only.
(b) Conference rate, via canal.

Slab Zinc

From	Rates per Net Ton to E. St. Louis	New York
Donora, Pa.	(a) $4.60	$3.80
Langeloth, Pa.	(a) 4.60	3.80
Palmerton, Pa.	7.10	3.00
Hillsboro, Ill.	1.40	7.00
Danville, Ill.	2.00	6.40
La Salle, Ill.	2.00	6.70
Springfield, Ill.	3.00	7.00
Cleveland, Ohio	5.80	5.00
Moundsville, W. Va.	4.40	3.80
Van Buren, Ark.	3.80	10.80
Fort Smith, Ark.	3.80	10.80
Bartlesville, Okla.	3.50	10.50
Blackwell, Okla.	3.80	10.80
Henryetta, Okla.	3.80	10.80
Sand Springs, Okla.	3.80	10.80
Cherryvale, Kan.	3.50	10.50
Black Eagle, Mont.	9.40	12.50
Park City, Utah	9.00	12.50

(a) To St. Louis, Mo.

Zinc Ores and Concentrates

To	From	Rate per Net Ton
Bartlesville, Okla.	Altoona, Kan.	$2.10
	Pittsburg, Kan.	1.09
	Galena, Kan.	1.30
	Joplin, Mo.	1.40
	Iola, Kan.	1.09
	Baxter, Kan.	1.40
	Miami, Okla.	1.40
	Quapaw, Okla.	1.40
	Kansas City, Mo.	1.60
Sand Springs, Okla.	Miami, Okla.	2.20
	Quapaw, Okla.	2.20
	Galena, Kan.	1.50
	Joplin, Mo.	1.50
	Iola, Kan.	2.40
Dewar, Okla.	Cave Springs, Mo.	2.00
	Cent City Spur, Mo.	2.00
	Chitwood, Mo.	2.00
Kusa, Okla.	Galena, Kan.	1.50
Henryetta, Okla.	Iola, Kan.	2.40
	La Harpe, Kan.	2.40
La Harpe, Kan.	Mound City, Kan.	.50
	Oswego, Kan.	.50
	Parsons, Kan.	.50
Coffeyville, Kan.	Galena, Kan.	1.10
	Joplin, Mo.	1.22
Bartlesville, Okla. (a)	Baxter, Kan.	1.80
	Miami, Okla.	1.80
	Quapaw, Okla.	1.80

(a) Lead ore and concentrates.

Rates on Ores and Concentrates

From	To	Value of Product $5	$10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate														
Butte, Mont.	Anaconda, Mont.	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	.22	22	.22	.22	.22
Butte, Mont.	Black Eagle, Mont. (a)	....	....	....	....	....	....	....	1.01	....	....	....	....	....	....	1.01
Great Falls, Mont.	East Helena, Mont.	....	....	1.57	....	1.76	....	1.98	....	2.43	....	....	....	....	....	2.55
Butte, Mont.	East Helena, Mont.	....	....	1.17	....	1.46	....	1.69	....	2.03	....	....	....	....	....	2.14
Paxton, Calif.	Salt Lake Smelters, Utah	....	....	....	....	....	....	....	....	6.30	7.00	7.70	....	8.35	8.60	8.85
Johannesburg, Calif.	Selby, Calif.	....	....	....	2.90	....	3.50	....	4.10	4.70	5.30	5.90	....	6.50	6.80	7.10
Johannesburg, Calif.	Humboldt, Ariz.	....	....	....	3.40	....	4.10	....	4.80	5.50	6.20	6.90	....	7.60	8.00	8.30
Pioche, Nev.	Humboldt, Ariz.	....	4.50(c)	7.74	....	8.55	....	9.36	....	9.99	....	....	11.25	....	....	12.42
Creede, Colo.	Durango, Colo.	....	....	3.25	3.50	3.75	4.00	....	4.25	4.75	5.25	5.75	6.05	....	....	7.10
Ouray, Colo.	Durango, Colo.	....	....	4.30	4.80	....	5.05	....	....	5.90	....	6.30	....	....	....	7.70
Kokomo, Colo.	Durango, Colo.	....	6.00	....	....	6.50	7.20	....	....	....	....	....	....	....	....	....
Telluride, Colo.	Durango, Colo.	....	....	....	....	....	4.30	....	5.00	5 50	6.00	6.3	....	6.60	7.10	7.70
Silverton, Colo.	Durango, Colo.	....	....	1.40	1.40	....	....	2.20	....	....	2.30	2.5	....	2.80	....	2.80
Tyrone, N. M.	Douglas, Ariz.	....	....	1.60	1 90	....	2.20	....	2.50	2 80	....	..	3.10	....	....	3.40
Tyrone, N. M.	El Paso, Tex.	....	....	1.60	1 90	....	2.20	....	2.50	2 80	....	..	3.10	....	....	3.40
Lordsburg, N. M.	Douglas, Ariz.	....	1.00	1.30	1 60	....	1.90	....	2.20	2 50	....	....	2.80	....	....	3.40
Lordsburg, N. M.	El Paso, Tex.	....	1.00	1.30	1.60	....	1.90	....	2.20	2.50	....	....	2.80	....	....	3.40
Tombstone, Ariz.	Douglas, Ariz.	....	....	.60	....	.90	....	....	....	1.30	....	....	1.60	....	....	1.90
Tombstone, Ariz.	El Paso, Tex.	....	....	1.90	....	2.50	....	....	....	3.80	....	....	4.40	....	....	4.40
Silver City, N. M.	Douglas, Ariz.	....	....	2.48	....	3.15	....	....	....	3.83	....	....	....	....	....	5.29
Ray Junction, Ariz.	Hayden, Ariz.	....	.10	....	.40	....	.50	....	.80	.90	....	....	1.00	....	....	1.10
Sandon, B. C. / Alamo Concentrator, B. C.	Tadanac, B. C.	1.50	1.60	1.70	1.90	2.00	2.50	....	2.60	2 90	3.40	3.50	....	3.70	3.80	3.90
Rossland, B. C.	Tadanac, B. C.	.90	.90	1.00	1.00	1.10	1.50	....	1.60	1.60	1.60	1.70	....	1.70	1.70	1.70
Rossland, B. C.	Tadanac, B. C.(d)	.30	.30	.30	.30	.50	.70	....	.80	.80	....	....	....	....	....	....
Republic, Wash.	Tadanac, B. C.	....	2.02	2.50	2.66	2.86	3.84	....	3.84	3.84	4.69	4.89	....	5.19	5.39	5.59

(a) Minimum tonnage of 200 tons per day. (b) In open cars, minimum 80,000 lb. (c) Siliceous ore tailing.
(d) Applicable on ore, only when shipped in trainload lots of not less than 10 cars and exclusive of switching charges at Rossland.

From	To	Value of Ores and Concentrates $10	$15	$20	$25	$30	$35	$40	$50	$60	$70	$75	$80	$90	$100
		Rate													
Burke, Idaho (a)	Bradley, Idaho	....	....	....	....	....	....	....	....	.68	....	.....	....	....	1.02
Burke and Wallace, Idaho (d)	East Helena, Mont.	....	....	....	....	3.00	....	3.25	3.50	3.75	4.00	.....	4.25	4.50	4.75
Sagel, Idaho	East Helena, Mont.	....	....	....	3.38	....	3.83	....	4.16	....	....	.....	....	.....	4.84
Arizona Tunnel, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	....	.35	....	.....	....	.....	.50
Bayview, Idaho	Bradley, Idaho	....	....	....	....	....	....	....	3.75	....	....	4.37½	....	.....	5.12½
Park City, Utah	Salt Lake Smelters	1.00(e)	1.10	1.25	....	1.50	....	1.75	....	2.00	....	.....	2.25	....	2.50
Eureka, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Tintic, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
St. Johns, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Ophir, Utah	Salt Lake Smelters	1.00	....	1.25	....	1.50	....	1.75	2.00	2.25	2.50	.....	2.75	3.00	3.25
Bingham, Utah	Garfield, Utah	....	.40	....	.75	....	....	....	.95	....	....	1.10	....	....	1.25
Cherry Creek, Nev.	Garfield, Utah (c)	....	....	4.60	....	5.10	....	5.60	6.10	6.60	7.10	.....	7.60	8.10	8.60
Cherry Creek, Nev.	Garfield, Utah (b)	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7 40	....	....
Goldfield, Nev.	Salt Lake Smelters	....	....	5.10	....	5.80	....	6.50	7.20	7.90	8.60	.....	9.30	10.00	10.70
Battle Mountain, Nev. (a)	Salt Lake Smelters	....	4.15	3.20	....	3.80	....	4.40	5.00	5.60	6.20	.....	6.80	7.40	8.00
Palisade, Nev. (a)	Salt Lake Smelters	....	2.90	3.20	....	3.80	....	4.40	5.00	5.60	6.20	.....	6.80	7.40	8.00
Mina, Nev. (a)	Salt Lake Smelters	....	....	3.60	....	4.30	....	5.00	5.70	6.40	7.10	.....	7.80	8.50	9.20
Lovelock, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Golconda, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Hazen, Nev. (a)	Salt Lake Smelters	....	....	3.20	....	3.90	....	4.60	5.30	6.00	6.70	.....	7.40	8.10	8.80
Tonopah, Nev.	Salt Lake Smelters	....	4.15	5.10	....	5.80	....	6 50	7.20	7.90	8.60	.....	9.30	10.00	10.70
Rogerson, Idaho	Salt Lake Smelters	3.00	....	3.50	....	4.00	....	4.50	5.00	5.50	6.00	.....	6.50	7.00	7.50
Georgetown, Colo.	Leadville, Colo.	....	....	3.50	....	3 75	....	4.00	5.00	5.00	5 80	.....	5.80	5.80	5.80
Shirley, Colo.	Leadville, Colo.	....	....	2.25	....	2.25	....	2.25	2.25	4.30	4.30	.....	4.30	4.30	4.30

(a) Minimum weight, marked capacity of car used, but not less than 80,000 lb. (b) Minimum weight, 80,000 lb. (c) Minimum weight, 40,000 lb.
* Indicates a change of tariff since last report.
(d) Crude ore for concentration, 30c. per ton, effective July 7.
(e) For $9 value rate is 95c.; $8 value, 90c.; $7 value, 85c.; $6 value, 80c.

Company Reports

United Verde Extension Mining Co.

The output of United Verde Extension Mining Co. for the half year ended June 30, 1924, was 21,250,940 lb. of copper and for July 3,474,178 lb., for August 4,011,746 lb., and for September 5,268,896 lb.

During September, for a period of sixteen days, the blast furnace was used in addition to the No. 1 reverberatory.

The copper is well sold ahead for the remainder of the year at an average of slightly in excess of 13c. per pound and no change in selling policy is under consideration. Construction at present is practically finished. The financial report is as follows:

Cash on hand Oct. 1st, 1924	$643,869.55
Liberty Bonds, par value $3,363,950—market value	3,425,101.43
U. S. Treasury Certificates	100,000.00

The board of directors, at a meeting on Sept. 17, 1924, declared a dividend of 50c. per share, payable on Nov. 1, 1924, to stockholders of record at the close of business Oct. 3, 1924.

Broken Hill South, Ltd.

Lead, Zinc, Silver; Australia

The net profit of Broken Hill South, Ltd., for the year ended June 30, 1924, amounted to £458,377 after providing £32,772 for depreciation of plant, £70,000 for taxation, and £7,000 for royalty. The assets at the end of the year, exclusive of shares held in other companies costing £392,870, show a surplus over liabilities of £840,501, compared with £596,422 the year before. Proceeds from the sale of 50,000 shares of British Australian Broken Hill account for £52,500 of this increase. Four regular dividends of 1s. 6d. per share were paid, and a bonus of 1s. per share on May 16, 1924, the total expenditure for dividends being £280,000. Debentures to the value of £14,000 were paid off, leaving £87,200 to be redeemed.

Ore reserves are estimated at 3,650,000 tons. The average weekly crude ore production was 4,606 tons, compared with 3,917 in 1923. The fire in the Central Mine continues to burn, though with decreased intensity. The water used to quench it has made unusual problems. The fine-crushing section of the concentrating mill has been remodeled. Tube mills, using steel balls as a grinding medium, have replaced the Marcy mills and grinding pans. The granular zinc flotation plant started regular work in March, with satisfactory metallurgical results.

The sulphide ore mined assayed 12.8 per cent lead, 11.4 per cent zinc, and 5.2 oz. silver. Recoveries of 97.1 per cent of the lead, 96.8 per cent of the silver, and 93.4 per cent of the zinc were made. The report of the company is highly informative as to the mining and metallurgical work being done and as to general conditions at the property. Mine costs totaled 26s. 0.5d. per ton; development, 1s. 11.5d.; and ore treatment, 14s. 6.3d.

Resumption of Futures Dealings at German Metal Exchanges

By Dr. James Rubinfeld
Charlottenburg, Germany

ON THE EVE of the Great War there existed an extended futures business in copper in Germany, which, generally speaking, rested upon the contract terms of Standard copper as in London. Because Germany was then the biggest European copper consumer, using 25 per cent of the world output, German warehouses could always dispose of sufficient reserves, which served as a means of settlement in fulfilling delivery obligations. Nowadays, however, Germany is, so to speak, stripped bare of essential reserves, but the need of time-bargains in metals is keenly felt, owing to the high cost of working capital which handicaps buying ahead and accumulating stocks. Furthermore, the usual price fluctuations have a far greater meaning for the weakened metal trades of Germany than anywhere else. The managing boards of the Berlin and Hamburg metal exchanges are therefore contemplating the re-introduction of former time-contracts as an instrument of encouraging metal trading all over Germany.

Futures contracts will have to be preliminarily set up for copper and lead, owing to the great importance of lead in the last few years, which is augmented by the fact that normally the output of secondary lead in Germany is a factor contributing to increase the holding of stocks. The outlook for establishing a similar market for other metals is very remote, owing to the control of zinc production by the Kattowitz Zinc Syndicate and that of aluminum by the state-owned works of Lauta, while any trading in silver is as yet forbidden under the law referring to dealings in bullion and foreign exchanges, which law, however, is likely to be rescinded in due course as the reasons for its existence, the gamble in marks, have disappeared with the stabilization of the national currency.

Other metals, such as tin or antimony, are largely speculative or have a narrow market only. The problem of warrants is also a serious matter in this connection, for as a consequence of high freight rates, purchasers have to look to the nearest delivery station for supplies. Besides, many questions as to turnover and taxes which were unknown here before the war, and to terms of settlements through the medium of banking establishments, are pressing for solution. The general need for this form of dealing in futures is such as to overcome all obstacles which stand in the way of covering transactions, the more so as it has become a usual way of handling metals by getting the needed supplies from old metals, rolling and galvanizing residues (people call any such transactions "Werkverträge") and to cover mutually these transactions by futures selling or purchasing on the Bourse. Hitherto all concerned have resorted to dealing simultaneously on the London Exchange, but currency and credit stringency constitutes a handicap. It is certain that the German bourses, which do not have to overcome the opposition of producers, as is the case with the New York Exchange, will make the change as conditions become normal, for which signs are decidedly favorable.

To all intents and purposes Germany cannot miss the opportunities of covering transactions among big users and expert dealers of metals when the trade is buoyant and of increasing importance, whereas the present quotations of the Hamburg and Berlin exchanges are mere records of world price alterations and have lost much of their former significance and authority. Some understanding with the London Exchange will also have to be maintained.

Copper Consumption by Industries

The following table shows the estimated consumption in millions of pounds of copper, primary and secondary, by quarters for the periods indicated, both as to totals and to leading industries that consume copper. Shipments to domestic fabricators are given for the same period.

	1923				1924		
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	First Quarter	Second Quarter	Third Quarter
Electrical manufacturers	75.0	86.0	90.0	106.0	100.0	105.0	96.0
Automobiles	47.9	57.9	47.9	46.8	53.0	48.7	44.5
Buildings	18.2	18.8	22.9	16.2	19.8	21.5	22.6
Ships, commercial	1.2	1.8	1.1	1.1	0.7	1.8	0.8
Locomotives	2.8	2.7	3.4	3.7	1.5	1.3	1.5
Railway cars	4.0	4.4	5.0	5.0	2.2	2.6	4.2
Railway bearings	6.3	6.7	6.9	6.9	6.4	6.1	6.5
Manufactures for export	30.1	27.7	20.3	25.8	25.0	27.3	30.0
Totals	185.5	206.0	197.5	211.5	208.6	214.3	206.1
Estimated totals	339.7	377.2	361.7	387.3	382.0	392.4	377.4
Domestic deliveries	393.6	394.2	329.4	343.8	447.3	390.3	318.8

The following table gives bookings and billings of General Electric and Westinghouse companies by quarters:

	General Electric		Westinghouse Electric	
1923	Bookings	Billings (a)	Bookings	Billings
First quarter	$80,014,045	.....	$45,741,000	$39,577,000
Second quarter	84,249,710	.....	47,649,129	35,094,884
Third quarter	65,483,549	.....	41,940,000	38,619,500
Fourth quarter	74,452,442	.....	36,435,500	39,195,900
Totals	$304,199,746	$271,309,695	$171,765,629	$152,487,284
1924				
First quarter	$73,487,903	.....	$37,860,000	$44,680,000
Second quarter	71,219,984	.....	40,030,000	38,260,000
Third quarter	58,389,832	.....	34,705,000	39,573,000

(a) Not reported by quarters.

Mining Stocks

Week Ended November 8, 1924

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Alaska-Br. Col.	N. Y. Curb	*10	*10	*10		
Anaconda	New York	37 7/8	36	37 1/8	De.15, Ja.21, Q	0.75
Arcadian Consol.	Boston	1 1/16	1 1/16	1 1/16		
Ariz. Com'l.	Boston	11	10 1/2	10 1/2	Jy.19, Jy.31	0.50
Calaveras	N. Y. Curb			2		
Calumet & Arizona	Boston	51 7/8	50 1/2	51 7/8	Se. 5, Se. 22 Q	0.50
Calumet & Hecla	Boston	15 5/8	15 1/4	15 5/8	My. 31, Jn. 16	0.50
Canario Copper	N. Y. Curb	4 1/4	3 1/2	4 1/4		
Cerro de Pasco	New York	47	45 1/2	46 7/8	Oc. 23, No. 1	1.00
Chile Copper	New York	33 3/8	32 1/2	33 1/4	De.3, De.29, Q	0.62 1/2
Chino	New York	23 3/8	21 1/2	23 1/4	Sept., 1920	0.37 1/2
Con. Coppermines	N. Y. Curb	3 1/4	2 15/16	3		
Copper Range	Boston	*24 1/4	*23 1/8	*24 1/2	May, 1923	1.00
Crystal Copper	Boston Curb	*65	*50	*65		
Davis-Daly	Boston	*40	*35	*40	Mar., 1920	0.25
East Butte	Boston	4 1/4	4 1/4	4 1/8	Dec., 1919	0.50
First National	Boston Curb	*40	*38	*40	Feb., 1919	0.15
Franklin	Boston	*70	*55	*55		
Gadsden Copper	Boston Curb	*63	*60	*63		
Granby Consol.	New York	19 1/4	17 3/4	18	May, 1919	1.25
Greene-Cananea	New York	16	15	16	Nov., 1920	0.50
Hancock	Boston	*75	*75	*75		
Howe Sound	N. Y. Curb	2 3/8	2 1/4	2 1/4	Ap.1,Ap.15, Q	0.05
Inspiration Consl.	New York	25 1/8	24 1/8	24 3/4	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	2	2	2	May, 1923	0.15
Isle Royale	Boston	15 3/4	14 1/2	15	Se. 1, Se. 15	0.50
Jerome Verde Dev.	N. Y. Curb	*93	*92	*92		
Jib Consol.	N. Y. Curb	*42	*39	*39		
Kennecott	New York	48 1/4	46 3/4	48 1/4	Se.5, Oc.1, Q	0.75
Keweenaw	Boston	*75	*75	*75		
Lake Copper	Boston			1 1/2		
Magma Copper	New York	35	33 1/2	34 1/2	Jan., 1919	0.50
Mason Valley	N. Y. Curb	1 1/8	1 1/8	1 1/8		
Mass Consolidated	Boston	1 1/4	1 1/4	1 1/4	Nov., 1917	1.00
Miami Copper	New York	21 1/4	21 1/4	21 3/8	No.1 No.15 Q	0.50
Mohawk	Boston	34	32 1/2	34	Se. 22, Oc. 13	1.00
Mother Lode Coa.	New York	8	7 1/2	8	Jn. 13, Jn. 30	0.37 1/2
Nevada Consol.	New York	14	13 1/2	14	Sept., 1920	0.25
New Cornelia	Boston	20 1/4	19 3/4	20 1/2	No. 7, No. 24	0.25
New Dominion	N. Y. Curb			2 1/2		
North Butte	Boston	2 1/4	2 1/8	2 1/8	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	1 1/16	1 1/16	1 1/16	No.14, De.2	0.05
Old Dominion	Boston	22	21	22	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†113	†108	...	Se.20, Oc.1 Q	1.00
Quincy	Boston	21	20 1/2	21	Mar., 1920	1.00
Ray Consolidated	New York	14 1/4	12 3/4	14	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			*15		
St. Mary's Min. Ld.	Boston	36	33 1/2	36	Ap.22, My.20	3.00
Seneca Copper	New York	1 1/4	1 1/8	1 1/4		
Shannon	Boston	1	*80	1	Nov., 1917	0.25
Shattuck Arizona	New York	7 1/2	7	7	Jan., 1920	0.25
Superior & Boston	Boston	1 1/16	1 1/16	1 1/16		
Tenn. C. & C.	New York	7 1/4	7 1/8	7 1/4	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	26 1/2	25 3/8	26 1/8	Oc. 3, No. 1	0.50
Utah Copper	New York	80 1/4	78 1/2	79 3/8	Se.15, Se.30,Q	1.00
Utah Metal & T.	Boston	*25	*25	*25	Dec., 1917	0.30
Victoria	Boston	*70	*70	*70		
Walker Mining	N. Y. Curb			2 1/16		
Winona	Boston	*45	*45	*45		
NICKEL-COPPER						
Internat. Nickel	New York	20 3/4	19 1/4	20 3/4	Jy.17, Au.1, Q	1.50
Internat. Nickel pfd.	New York	94	93	94	Oc.16, No.1, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	†3 1/4	†3 1/8	...		
National Lead	New York	157	152	157	Se.12, Se.30, Q	2.00
National Lead pfd.	New York	117	116	117	No.21,De.15, Q	1.75
St. Joseph Lead	New York	35 3/4	34 1/2	35 3/4	De. 9, De. 20	0.50
ZINC						
Am. Z. L. & S.	New York	8 1/4	7 7/8	8	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	30 1/4	29	30 1/4	Nov., 1920	1.50
Butte C. & Z.	New York	6	5	6	Mar., 1923	0.50
Butte & Superior	New York	17 1/8	16	16 3/8	Je.15, Je.30, Q	0.50
Callahan Zn-Ld.	New York	3 1/2	3 1/2	3 1/2	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	163	163	163	Oc.,No.,'24 QX	4.00
United Zinc	N. Y. Curb			*25		
Yellow Pine	Los Angeles	*70	*58	*58	June, 1924	0.04
SILVER						
Alvarado	Boston Curb	2 1/8	1 3/8	1 1/2		
Beaver Consol.	Toronto	*17	*17	*17	May, 1920	0.03
Castle-Trethewey	Toronto	*72	*71	*71		
Coniagas	Toronto	2.20	2.10	2.15	Ap.20, My.1	0.02 1/2
Crown Reserve	Toronto	*54	*52 1/2	*53 3/4	Jan., 1917	0.05
Keeley	Toronto	2.32	2.29	2.30	Sept. 15, SA	0.12
Kerr Lake	N. Y. Curb	1 7/8	1 3/4	1 7/8	Oc. 1, Oc. 15,	0.12 1/2
La Rose	Toronto	*8	*8	*8	Apr., 1922	0.10 1/2
Lorrain Trout Lake	Toronto	1.45	1.44	1.44		
McKinley-Dar.-Sav.	Toronto	*12	*11	*11 1/2	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.70	2.67	2.68	Sept., 1919	0.12 1/2
Nipissing	N. Y. Curb	6 1/4	6	6 1/4	Oc.1,Oc.20,QX	0.30
Ontario Silver	New York	7	7	7	Jan., 1919	0.50
Temiskaming	Toronto	*20	*20	*20	Jan., 1920	0.40
GOLD						
Alaska Gold	New York	1/8	1/8	1/8		
Alaska Juneau	New York			1		
Argonaut	Toronto	*28	*24 1/2	*27		
Carson Hill	Boston	*87	*62	*75		
Cresson Consol. G.	N. Y. Curb	4	3 1/4	4	Se.30, Oc.6 Q	0.10
Dome Mines	New York	15	14 1/2	14 3/4	Oc.3, Oc.20, Q	0.50
Golden Cycle	Colo. Springs	1.31	1.31	1.31	My.31, Jn.10 Q	0.03
Hollinger Consol.	Toronto	13.98	13.90	13.95	No.13, De.1,	0.05
Homestake Mining	New York	45	45	45	No.2, No.25,M	0.50
Kirkland Lake	Toronto	*19	*19	*19		
Lake Shore	Toronto	3.90	3.88	3.89	Se.1, Se.15, Q	0.05
McIntyre-Porcupine	New York	16 1/4	15 3/4	16	No. 1, De. 1	0.25
Newray	Toronto	*27	*26	*26		
Portland	Colo. Springs	*45	*45	*45	Oct., 1920	0.01
Teck-Hughes	Toronto	1.14	1.13	1.13		
Tom Reed	Los Angeles	*22 1/2	*20 1/2	*20 1/2	Dec., 1919	0.02
Tough-Oakes	Toronto	*47 1/2	*44	*46 1/2		
United Eastern	N. Y. Curb	*40	*38	*40	Jy.18, Jy.31, Q	0.05
Vipond Cons.	Toronto	1.27	1.23	1.26		
Wright-Hargreaves	Toronto	3.65	3.60	3.64	Se.15,Oc.1, Q	0.02 1/2
GOLD AND SILVER						
Black Oak	N. Y. Curb			*89		
Con. Cortez	N. Y. Curb	*12	*12	*12		
Con. Virginia	San Francisco	*6 1/2	*4 1/2	4 1/2		
Continental Mines	N. Y. Curb			2 1/2		
Dolores Esperanza	N. Y. Curb			*32	Jy.1, Jy.10 Q	0.05
Premier Gold	N. Y. Curb	2 3/8	2 1/4	2 1/4	Se. 25, Oc. 30	0.08
Tonopah Belmont	N. Y. Curb	*60	*60	*60	Apr., 1923	0.05
Tonopah Divide	N. Y. Curb			*21	Se. 22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	3 1/2	3 3/4	3 1/2	Se. 10, Oc. 1	0.05
Tonopah Mining	N. Y. Curb	2	2	2	Se. 30, Oc. 21	0.07 1/2
Unity Gold	N. Y. Curb	1	1	1		
West End Consol.	N. Y. Curb			*52	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*50	June, 1918	0.02
SILVER-LEAD						
Ahumada	Boston Curb	7	6 1/2	6 3/4	Se.16, Oc.2, X	0.15
Bingham Mines	Boston	16	16	16	Sept., 1919	0.25
Cardiff M. & M.	Salt Lake	1	1	1	Oct., 1924	0.10
Chief Consol.	Boston Curb	3	2 1/8	2 1/8	Ap.19, My.1,Q	0.10
Columbus Rexall	Salt Lake	*27	*25	*25	Aug., 1920	0.03
Consol. M. & S.	Montreal	48 1/2	47 1/2	48	Jn.30, Jy.15	0.75
Daly Mining	Salt Lake			2.00	July, 1920	0.10
Erupcion	Boston Curb	2 1/4	2 1/8	2 1/8	Se. 15, Oc. 2, X	0.15
Federal M. & S.	New York	14 1/4	13	14 1/2	Jan., 1909	1.50
Federal M. & S. pfd.	New York	54 1/8	42 1/2	53	Au.25, Se.15,Q	1.75
Florence Silver	Spokane	4 3/8	3 7/8	4 1/8	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	9 1/4	9	9 1/8	Sept. 15, 1924	0.25
Iron Blossom Con.	N. Y. Curb	*25	*25	*25	Oc.25, 1924	0.02 1/2
Marsh Mines	N. Y. Curb			*5	June, 1921	0.02 1/2
Park City	Salt Lake	4.60	4.20	4.60	Se. 15, Oc. 1	0.15
Park Utah	N. Y. Curb			3 1/2	Mc. 15, Ap. 1	0.15
Prince Consol.	Salt Lake			8	Nov., 1917	0.02
Silver King	N. Y. Curb			*50	Se. 20, Oc. 1	0.15
Silversmith	Spokane	*29	*28 1/2	*29	Oc. 1, Oc. 10	0.01
Tamarack-Custer	Spokane	1.44	1.40	1.44	Se. 22, Se. 29	0.25
Tintic Standard	Salt Lake	8.00	7.85	8.00	Se.1, '24, X	0.25
Utah-Apex	Boston	2 1/4	2 1/8	3 1/8	Se.5, Se.15, Q	0.25
IRON						
Bethlehem Steel	New York	42 1/4	39 3/8	42 1/4	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit			*30		
Char. Iron pfd.	Detroit	*70	*70	*70		
Colorado Fuel & Iron	New York	40 3/8	37 1/2	39	Au.11, Au.25,Q	2.00
Col. Fuel & Iron pfd.	New York			108 1/2	No.10, No.26 Q	2.00
Gt. North'n Iron Ore	New York	31 1/2	30 1/2	30 3/8	De.10, De.27	2.00
Inland Steel	N. Y. Curb			4	No.14, De.1, Q	0.62 1/2
Mesabi Iron	N. Y. Curb	2 7/8	2 3/4	2 3/4		
Replogle Steel	New York	13 1/4	12	13 1/4		
Republic I. & S.	New York	45 3/4	43 1/4	44 1/2	May, 1921	1.50
Republic I. & S. pfd.	New York	84	83 1/2	83 1/2	Se.15, Oc.1, Q	1.75
Sloss-Sheffield S. & I.	New York	70	67 1/2	69 1/2	Se.11, Se.20, Q	1.50
Sloss-Shef. S.&I. pfd.	New York	90 1/4	90	90 1/2	De.9, De.20, Q	1.75
U. S. Steel	New York	113	109	112 1/4	No.29,De.3, QX	1.75
U. S. Steel pfd.	New York	122 1/2	121	122 1/2	No.4, No.29, Q	1.75
Virginia I. C. & C.	New York	37	37	37 3/4	De.15, Ja.2	1.50
Virginia I.C.&C.pfd.	New York			76	Jn. 17, Jy. 1	2.50
VANADIUM						
Vanadium Corp.	New York	26	24 1/2	25	Jan., 1921	1.00
ARSENIC						
Western Utah Copper	N. Y. Curb	*15	*15	*15		
ASBESTOS						
Asbestos Corp.	Montreal	26	26	26	Se.29, Oc.15 Q	1.00
Asbestos Corp. pfd.	Montreal	62 1/4	62 1/2	62 1/4	Oc.1, Oc.15, Q	1.50
SULPHUR						
Freeport Texas	New York	8	7 5/8	7 7/8	Nov., 1919	1.00
Texas Gulf	New York	82	81 1/4	81 3/8	Se.2,Se.15, QX	1.75
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	5	4 1/2	5		
MINING, SMELTING AND REFINING						
Amer. Metal	New York	48 1/4	46 1/2	47 1/4	No.19, De.1 Q	0.75
Amer. Metal pfd.	New York	113	112	112 1/4	No.20, De.1, Q	1.75
Amer. Sm. & Ref.	New York	83 7/8	79 1/4	82 1/2	Oc.17, No.1, Q	1.25
Amer.Sm.&Ref.pfd.	New York	106 1/4	105	105 1/2	No.17, De.1 Q	1.75
U. S. Sm. R. & M.	New York	34 1/4	33	34	Jan., 1921	0.50
U.S. Sm. R.&M.pfd.	New York	45 7/8	45 1/2	45 3/8	Oc.9, Oc.15 Q	0.87 1/2

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

Boston quotations courtesy Boston Stock Exchange; Toronto quotations those of the Standard Stock Exchange of Toronto, by courtesy of Arthur E. Moysey & Co.; Spokane, Pohlman Investment Co.; Salt Lake, Stock and Mining Exchange; Colorado Springs, Colorado Springs Stock Exchange.